# THESIS
# FOR THE AWARD OF DEGREE OF
# DOCTOR OF MEDICINE
# SESSION 2020-2023

# COMPARISON OF USG GUIDED SUBCOSTAL TRANSVERSUS ABDOMINIS BLOCK WITH INTRAPERITONEAL INSTILLATION OF BUPIVACAINE FOR PAIN RELIEF AFTER LAPAROSCOPIC CHOLECYSTECTOMY


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**Prof. Dr Alka Agrawal**

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"Be grateful for whoever comes, because each has been sent as guide from beyond."

- Rumi

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I shall cherish my association with Department of Anaesthesia and Critical Care, Santosh Medical College and Hospital, Ghaziabad.

**Dr. Kashish Khan**

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# INTRODUCTION

Since the year 1987, laparoscopic cholecystectomy is a normal procedure is considered to be the" Gold Standard" method for the treatment of acute and chronic cholecystitis, systematic cholelithiasis,[1] biliary dyskinesia, acalculous cholecystitis, gallstone, pancreatitis, and gallbladder masses/polyps [2] with an exclusion of gallbladder cancer treatment where open cholecystectomy is considered to be the best option.

Gallstones are the most common biliary pathology. It is estimated that gallstones affect 10 to15 percent of the population in western countries. They are asymptomatic in the majority ofcases (>80%). Approximately, 1–2% of asymptomatic patients will develop symptoms requiring surgery per year, making cholecystectomy one of the most common operations performed by general surgeons.[3]

The prevalence of gallstones seems to being increasing with mainly in females and obese people. It can be mainly classified as:

- Cholesterol based
- Pigmented
- Mixed stones

Furthermore, the reasons for the cause of cholelithiasis are well established as follows:

- Conditions due to obesity, high-caloric diets and certain medications (e.g., oral contraceptives) could increase the secretion of cholesterol and supersaturate the bile increasing the lithogenicity of bile and resulted in hypocholesteremia and thereby cholesterol stones. Resection of the terminal ileum, which diminishes the enterohepatic circulation, will deplete the bile acid pool and result in cholesterol super saturation. Nucleation of cholesterol monohydrate crystals from multi lamellar vesicles is a crucial step in gallstone formation.

- Biliary stasis results in formation of pigment stones. These stones contain<30% cholesterol. There are two types – black and brown. Black stones are largely composed of an insoluble bilirubin pigment polymer mixed with calcium phosphate and calcium bicarbonate. Black stones are associated with hemolysis, usually hereditary, spherocytosis or sickle cell disease. Brown pigment stones contain calcium bilirubinate, calcium palmitate and calcium stearate, as well as cholesterol. Brown stones are rare in the gallbladder. They form in the bileduct and are related to bile stasis and infected bile. The stagnation of bile in the gallbladder leads to high concentration of cholesterol and bile pigment because of excessive absorptionof water and easily soluble salts. Precipitation under these circumstances leads to mixed stones, the most common type.

The natural history of gallstone studies has shown that symptoms due to this develops at a rate of less than 2% per year. Therefore, no intervention is required for patients with asymptomatic gall stones. The potential role of oral dissolution therapy and lithotripsy has been superseded by the advent of laparoscopic cholecystectomy.[4]

Though the laparoscopic cholecystectomy is being considered as the gold standard method for treating gallbladder stones, earlier this procedure was contraindicated in patients with cirrhosis of liver, end-stage renal disease, and severe cardiovascular disease. But increased practice and experience with this procedure has overcome these contraindications [5-7].

Major benefit of using laparoscopy for upper GI surgery is that it would avoid upper abdominal incision. Such upper abdominal incisions otherwise can hinder post-operative pulmonary rehabilitation, cause of surgical wound pain, and thereby increases the total medical cost. [8-10] Considering the major benefits, laparoscopic cholecystectomy is being believed to be the treatment of choice for a wide spectrum of gallbladder diseases. [11-14].

Despite these benefits including it is a minimally invasive surgery, intensity of pain in early post-operative period is significant (Barczyński, 2003).[15] There are several methods employed in the management of postoperative pain after laparoscopic cholecystectomy such as conventional systemic analgesics, including paracetamol, non-steroidal anti-inflammatory drugs, systemic opioids, thoracic epidural analgesia, low-

pressure pneumoperitoneum, and warm air with all having its limitations and side effects.

Recently, the uses of peripheral plane blocks that deliver local anaesthetic into the transversus abdominis fascial plane have become popular for operations that involve incision(s) of the abdominal wall. Thus, the transversus abdominis plane (TAP) block has been shown to reduce perioperative opioid use in elective abdominal surgery (Kadam 2001),[16] including open appendectomy (Neraj, 2009),[17] laparotomy (Mc Donnell et al., 2011),[18] caesarean section (Mc Donnell et al.,2008),[19] and laparoscopic cholecystectomy (El-Dawlatly et al., 2009).[20]. The ultrasound-guided transversus abdominis block is recently described variation on the TAP block which produces reliable unilateral supraumbilical analgesia.

Pain after laparoscopic cholecystectomy is less intense and lasts a shorter time, compared to pain after open cholecystectomy, [8-10] and patients can be discharged after few days of surgery due to this. They can also resume their routine daily activity more quickly after surgery in comparison to open cholecystectomy. However, it is not a pain free procedure.

Pain intensity usually peaks during the first postoperative periods and usually declines over the following 2-3 days.[21]. Postoperative pain seen after laparoscopic procedures has 2 components: visceral and somatic. Visceral component is due to handling of tissues during the surgery which causes tissue injury and the stretching of nerve endings.[22] Pneumoperitoneum causes stretching of the peritoneum and diaphragmatic muscle fibers, which in turn irritates phrenic nerve endings. Phrenic nerve shares a common route with nerves that innervate the shoulder, so irritation of this nerve can cause shoulder tip pain. The somatic component of pain is dueto the incisions made in the abdomen for the entry of trocar.[23]

Post-operative pain management is a major challenge after laparoscopic surgeries.[24] Effective pain management provides early ambulation of the patient, which significantly reduces the risk of DVT and PE.[25] Effective analgesia also increases patient's ability to take deep breaths which helps to decrease the risk of pulmonary complications like atelectasis and pneumonia. Hospital stay also can be prolonged due to pain and can lead to increased morbidity. Various methods have been introduced

to control post-operative pain after L C such as the use of Local anesthetic,[26] intra-peritoneal infiltration of LA,[27], pre-operative administration of NSAID,[28] utilizing $CO_2$ at body temperature, applying intra- pleural morphine,[29] and combined use of NSAIDs and opioids.[30] Observation of peritoneum inflammation after CO2 pneumoperitoneum provides a rationale for the use of non-steroidal anti-inflammatory drugs (NSAIDs).[31] However, treatment of post laparoscopy pain with NSAIDs yields controversial results.[32-36] Moreover, because of the pathophysiologic changes of renal blood flow induced by pneumo-peritoneum, the safety of preoperative administration of NSAIDs may be questionable.[37]

Intra-peritoneal instillation of local anesthetics has been proposed to minimize postoperative pain after laparoscopic surgery.[38] The main advantage of using local anesthetics is that they do not have the adverse effects of opioids like PONV, sedation,[39] impairment of return of gastrointestinal motility, and pruritus, which may delay recovery of the patient and finally discharge from hospital.

Controversy exists on source of pain after laparoscopic procedures. Some clinicians mention that the placement of trocars through the abdominal wall is the primary source, whereas others believes that most pain arises from intra-peritoneal dissection.

Variable analgesic effects of periportal infiltration of local anesthetics, intra-peritoneal spraying above gall bladder, and instillation into sub-diaphragmatic space and into the sub- hepatic space covering the area of the hepato-duodenal ligament have been reported.[40]

Even though several studies have reported about hand-full of drugs showing control over the pain after laparoscopic surgery, still there is a need to identify drugs that could be cost effective and highly control the pain after laparoscopic cholecystectomy surgery with minimal side effects.

In the present study, we have compared ultrasound-guided subcostal transversus abdominis (STA) block with intraperitoneal instillation of bupivacaine in reducing postoperative pain, total analgesic consumption, nausea, vomiting, and recovery time in patients after elective laparoscopic cholecystectomy.

# SAMPLE SIZE CALCULATION

## Sample size:

The required sample size for the current study was calculated with reference to a recently published article by Hariom Khandelwal et al.,[106] in the year 2019 and using the below given formulae it was calculated as follows:

$Z_{\alpha}$ = 1.98 (0.5%)

$Z_{[1-\beta]}$ = 1.26 (90%)

∑size-: (effect size) = 0.87

SD = 0.97

$n = 2(z_{\alpha} + z_{1-\beta})^2 * SD^2 / d^2$

n=29.11 ≈ 30

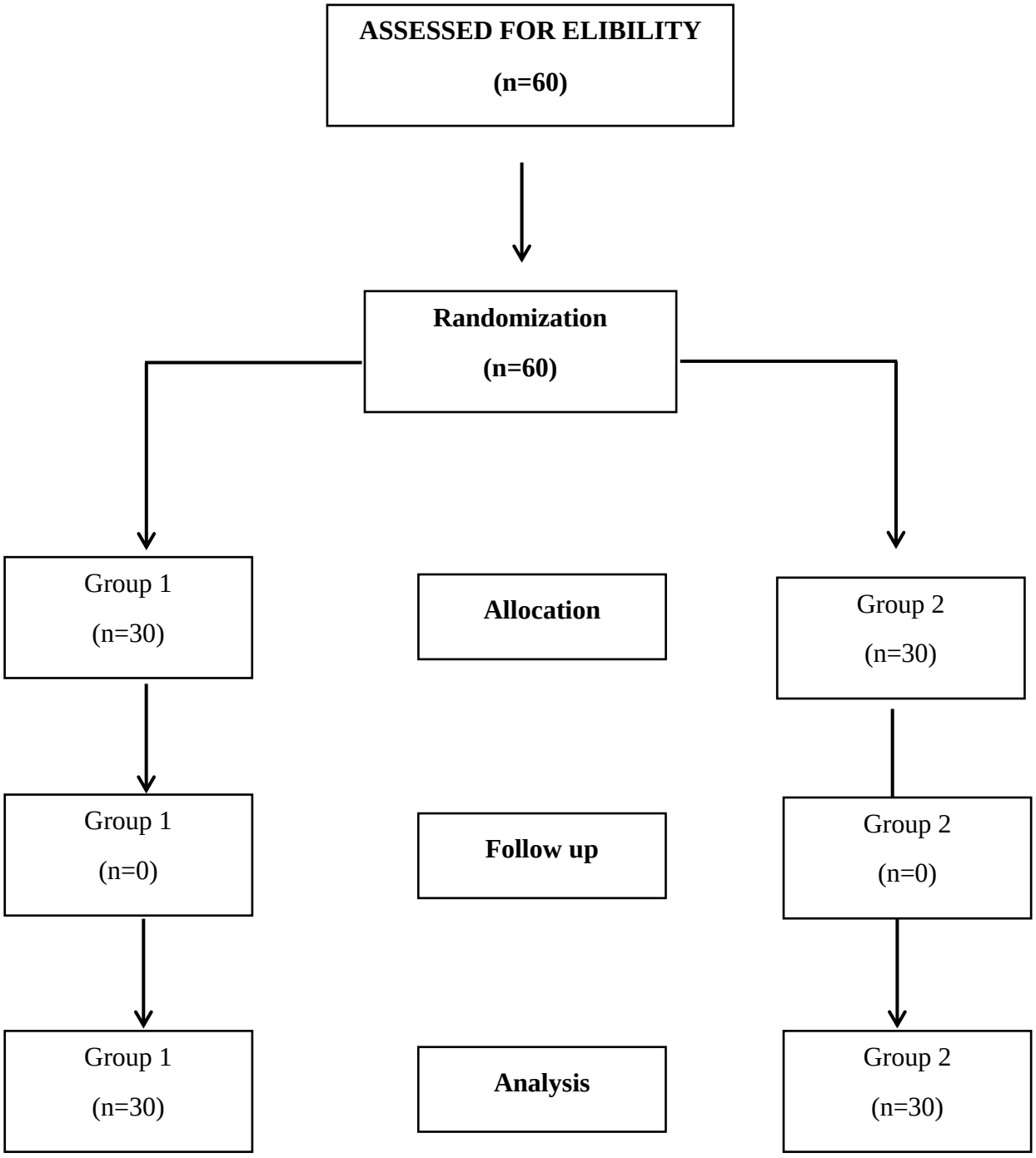
n=30 in each group

The patients required for the current study was randomly allocated into 2 groups of 30 patients each, as Group 1 (n=30): Patients receiving bilateral subcostal TAP block and Group 2 (n=30): Patients receiving intraperitoneal bupivacaine

Group 1 (n=30)- Patients receiving USG guided tap block before surgery performed by trained anaesthetists.

Group 2 (n=30)- Patients receiving 40 ml of 0.25 % bupivacaine after surgery, instillation done by surgeon intraperitoneally at gall blabber bed and under the domes of diaphragm under direct vision.

# CONSORT FLOW CHART



# AIMS AND OBJECTIVE

## AIM:

To compare ultrasound guided subcostal transverses abdominis plane block with intraperitoneal instillation of bupivacaine for pain relief patients undergoing laparoscopic cholecystectomy.

## OBJECTIVES:

Primary -To assess and compare the quality and duration of post-operative analgesia & post-operative complications if any in both the groups within first 24 hrs of surgery in patients undergoing laparoscopic cholecystectomy under general anaesthesia.

Secondary – To assess the post-operative nausea and vomiting and post-operative shoulder tip pain.

## NEED FOR STUDY:

To asses if or when patient will be needing rescue analgesia after TAP block or intraperitoneal instillation of bupivacaine in an elective lap cholecystectomy.

# REVIEW OF LITERARTURE

Bernheim from the United States was the first surgeon to publish his experience in laparoscopy entitled "organoscopy" in the Annals of surgery, 1911. [41-43] But after that the invention was paused due to World War I till mid-1920. In 1923 Kelling again started "organoscopy". He presented his 22 years of experience of diagnostic laparoscopy in front of German surgical society.[44] This is how the era of minimally invasive surgery was started. But still there was lack of technology in this procedure which limited the practice of this. Light source was lack. Due to which there was risk of danger of thermal burns to intra- abdominal organs, bowel perforation and vascular injuries. These real risks significantly limited the use of laparoscopy. [45] In 1938, Veress developed a needle with a spring-loaded obturator which allowed safe insertion and insufflation of the peritoneal cavity.[46] When the imaging problem was solved the next problem was excess intra-abdominal pressure and thermal injury to the internal organ with unipolar cautery. In 1952, Fourestier, Gladu and Valmiere revolutionized laparoscopy by introducing a quartz rod to transmit an intense light beam distally along the telescope enabling photographic images and furthermore in the year 1959 closed circuit television was also added.[41, 42, 45] Still another decade was required to overcome the dangers of the insufflation of the abdomen. In 1966, Kurt semm introduced an automatic insufflator device which was capable of monitoring intra-abdominal pressure; he also developed thermocoagulation and designed a high volume irrigation aspiration system. He then perfected the end loop applicator, knot-tying techniques and instruments. He performed numerous gynecological procedures, bowel suturing, omental adhenolysis, tumor biopsy and staging, and notably, incidental appendectomy. [41,45, 46] At last in 1978, when Hasson introduced trocar under direct visionmany doubts were cleared among surgeons and they were more convinced for the procedure.[46]

Mouret from France was the first person to perform laparoscopic cholecystectomy on human.[47] Within two years, in USA, this procedure was being adopted. Due to the massive demand from the patients, standard traditional stages of scientific evaluation were bypassed. In September 1992, a NIH consensus conference held in Bethesda concluded that laparoscopic cholecystectomy is the treatment of choice for gallstone diseases.[48]

Patients' complaint of some post-operative pain after laparoscopic procedures. They experience mainly a diffuse pain over abdomen, back and shoulder region. The intensity of pain usually peaks during the first few hours after surgery and declines over the following 2-3 days.[49] Pain experienced after laparoscopic procedure is due to the stretching of the intra-abdominal cavity,[50] peritoneal inflammation and irritation of phrenic nerve, caused by residual $CO_2$ in the peritoneal cavity.

Rapid distention of the peritoneum may be associated with tearing of blood vessels, traumatic traction of the nerves and release of inflammatory mediators. The prolonged presence of shoulder tip pain [51,52] suggests excitation of the phrenic nerve. This pain present after laparoscopy, is associated with persistent pneumo-peritoneum, sometimes for 3 days. There is a statistically significant correlation between the width of the gas bubble and pain score,[53] and this pain can be reduced by aspiration of the gas under the diaphragm, by "active aspiration", that is repeated suction and manipulation,[54] by the use of a gas drain[55] or by application of local anesthesia under the diaphragm under direct vision[56] or through a sub- phrenic catheter.[57] Peritoneal inflammation or the presence of residual gas is probably the reason for the upper abdominal pain after lower abdominal surgery or after diagnostic laparoscopy.[51]

Pain is an unpleasant sensory and emotional experience arising from actual or potential tissue damage. Pain develops by stimulating nociceptors or proximal ends of sensory nerves. These receptors release numerous mediators and activate a chain of inflammation process during trauma from surgery.[58,59] It is well known that the peritoneum is slightly sensitive free from pain on sharp, cutting and puncture wounds and it is highly sensitive to distention, tearing and separation.[60] On the local level, carbon dioxide reacts with the tissue and activate the emergence of sour products, which put local pressure on the nerve endings the peritoneum, and the right phrenic nerve.[61] The somatic pain component is well controlled by NSAIDs, and opioids postoperatively.[62]

Pain reduction after irritation of the phrenic nerve is achieved by performance at decreased insufflation pressure [63,64] and local abdominal lavage with saline solution. Previous studies suggest the aetiology of postoperative pain in patients after laparoscopic cholecystectomy is multifunctional consisting visceral pain from the operation itself and parietal pain originating from the trauma to diaphragm as well as

the peritoneum and the incision pain itself. For instance, not all internal organs are sensitive to pain and some can be damaged quite extensively without the person feeling a thing. Many diseases of liver, the lungs or the kidneys are completely painless and the only symptoms felt by the patient are derived from the abnormal functioning of these organs. On the other hand, relatively other lesions in viscera such as the stomach, the gallbladder or the ureter can produce excruciating pain. There is no close relationship between damage and pain like that seen when the lesions affect a somatic organ. The reason for this situation lies with the innervation of the internal organs. Some viscera are innervated by sensory neurons that signal harmful events (nociceptors) but other internal organs lack this form of sensor, so that injuries or lesions to these organs cannot be translated into signals that the brain would perceive as painful. The internal organs with nociceptors are mostly the hollow viscera (the gut, the gallbladder, the uterus) and it is from these organs that we get most of our visceral pain sensations.

However, patients experienced acute pain immediately after surgery till day 7 that might last for even 3 months after the surgery that is considered as chronic pain. Both acute and chronic pain would arise from cutaneous deep somatic or visceral structures. The acute pain can be categorized into two namely:

- Somatic Pain, and
- Visceral Pain.

**Somatic pain:** Pain that arise from the skin, subcutaneous tissue, mucous membrane is considered as somatic pain that can be sensible as sharp pricking and well localized. Pain that arises from the muscles, tendons, joints and bones called as deep somatic pain has dull aching quality and less well localized. The degree of localization might be due to both the intensity and duration of pain.

**Visceral pain:** Visceral nociceptors are very similar to those that innervate the skin or muscle. They respond not only to intense mechanical stimuli (distension and overstretching) but also to irritant chemicals and especially to the products of inflammation.[65] Some visceral nociceptors activates only after the inflammation of the mucosa of the organs that they innervate. They are particularly important in signaling pain from inflamed and sensitized viscera. Receptor which is used in

visceral pain pathway is unmyelinated C fibers and it is well known that the stimuli likely to induce cutaneous pain are not allogenic in the viscera. This explains why in the past the viscera were considered to be insensitive to pain.

**Adequate stimuli for induction of visceral pain are**:

1. Contraction and abnormal distention of the hollow visceral muscle walls.
2. Rapid stretching of the capsule of solid visceral organs.
3. Sudden anoxemia of visceral muscles.
4. Formation and accumulation of pain mediators.
5. Direct action of chemical stimuli.
6. Traction or compression of ligaments and vessels.
7. Inflammatory process.
8. Necrosis of any structures.

**Characteristic features of true visceral pain:**

It is a type of pain which is dull, deep and not well defined. It is differently described by different patients. Sometimes it is difficult to locate this type of pain as it has tendency to irradiate. Often it is accompanied by a sense of malaise. This type of pain induces strong autonomic reflex phenomena.

**Post laparoscopic Cholecystectomy Pain control:**

Various methods have been proposed to control laparoscopic postoperative pain such as the use of local anaesthesia,[66] intra-peritoneal infiltration of local anaesthesia,[67] preoperative administration of anti-inflammatory drugs,[68] utilizing carbon dioxide at body temperature, applying intra-peritoneal morphine,[69] and the combined use of NSAIDs and opioids.[70] Other methods which can reduce the incidence of post-operative pain after LC are irrigation and suction during the surgery, less number of ports, keeping low intra -abdominal pressure. Because pain is multifactorial, no consensus has been reached regarding effective postoperative pain relief.[71]

**Use of TAP Block for Postoperative Pain Control:**

TAP block has been used as an adjunct for postoperative pain control in abdominal, gynecologic and urologic surgery involving the T6 to L1 distribution. This block is indicated for postoperative analgesia for lower abdominal surgeries such as appendectomy, hernia repair, caesarean section, abdominal hysterectomy and prostatectomy. Efficacy in laparoscopic surgeries and renal transplantation have been demonstrated. Bilateral blocks can be given for midline incisions or laparoscopic surgery.

**Various approaches for TAP Block:**

- Anatomical Landmark-Based Approaches
- Ultrasound-Guided Approaches
- Posterior Approach
- Subcostal Approach
- Oblique Subcostal Approach

**Technique based on USG Subcostal Approach:**

The subcostal TAP block involves the injection of local anesthetic into the TAP lateral to the line as semilunar is immediately inferior and parallel to the costal margin and is suitable for Periumbilical surgeries. In this approach, the ultrasound probe is placed near the xiphoid process, parallel to the subcostal margin. TA is the most hypoechoic muscle, lying below the Rectus muscle. After identification of the neuro fascial plane between the TA muscle and Rectus Abdominis, the block needle is inserted anteriorly,in-plane to the probe.

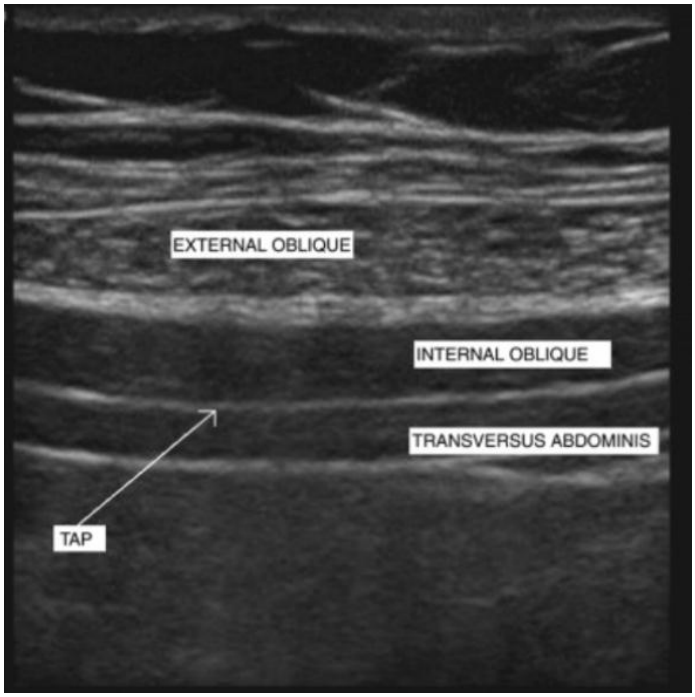



**Image 1**: showing USG view of and anatomy of external oblique, internal oblique and transversus abdominis muscle. TAP block is given between the internal oblique and transversus abdominis muscle.

## Use of local anaesthetic for post-operative pain management:

Numerous clinical studies have investigated the use of regional LA (levobupivacaine, bupivacaine, ropivacaine), in combination with other modalities for pain relief following laparoscopic cholecystectomy to avoid the adverse effects of opioids, which may delay recovery and hospital discharge. Post-operative pain after laparoscopic cholecystectomy can be reduced by either pre- or post-operative skin infiltration of local anesthetics or by intra- peritoneal local anesthetics instillation.

## Pharmacology of Local Anaesthetics:

Many local anaesthetic medications have been used of which cocaine, amethocaine, lidocaine, mepivacaine, bupivacaine (levobupivacaine), ropivacaine are most commonly used.

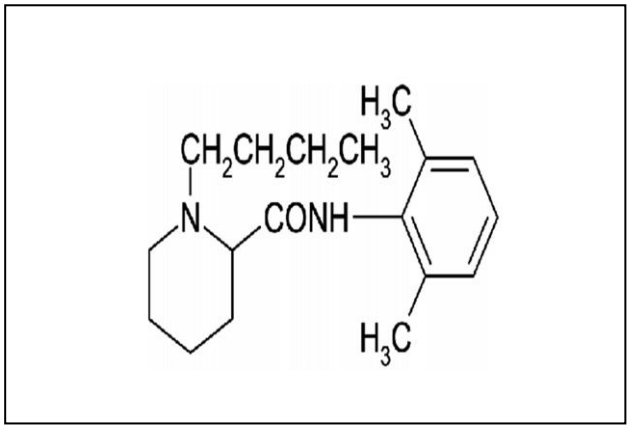
*Lidocaine* was the 1$^{st}$ amide local anaesthetics to be introduced in 1948. It remains one of the most widely used anaesthetics as it be used intravenously, intrathecally and as a local infiltration. It is also a class 1b antiarrhythmic drug. It

has fast onset of action due its pKa of 7.8, which is closer to the physiological pH of 7.4, and is moderately water and lipid soluble. It has moderate duration of action and is least toxic of all the amides probably due to its relatively low protein-binding capacity of 64%. The addition of adrenaline, a vasoconstrictor, reduces toxicity allowing for higher doses to be used for local tissue infiltrations. The recommended doses are 7mg/kg and 3mg/kg with and without adrenaline respectively. Neurotoxicity has made it unpopular in intrathecal uses, but still used safely for local analgesia and intravenous uses.[28]

## Bupivacaine:

Bupivacaine racemic form was introduced in 1963, while levobupivacaine (s-enantiomer of bupivacaine) in 1995. Amino-amide local anaesthetic has slow onset and long duration of action (3-4 times more potent than lidocaine).

**Chemical Structure of Bupivacaine:**




**Physiochemical properties**:

| | | |
|---|---|---|
| Molecular Formula | : | $C_{18}H_{28}N_20$ |
| Pk | : | 8.1% |
| Ionizing pH | : | 7.4 -8.3 |
| Plasma Binding Protein | : | 95% |
| Stability | : | +++ |
| Molecular Weight | : | 288.427g $mol^{-1}$ |
| Compatibility with Adrenaline | : | +++ |

**Pharmacokinetics:** The rate of general absorption of bupivacaine and alternative native anaesthetics depends upon the dose and concentration of drug administered, the route of administration and also the presence or absence of vasoconstrictor within the preparation. onset of action (route or dose dependent) in some 1-17 mins, period of action consequently lasts from 1-9 hrs. half life of drug is around 7 hrs in adult and 8 hrs in neonates. Peak plasma concentration period for peripheral, epidural or caudal anaesthesia is 30-45 mins. Bupivacaine is a metabolised in liver by granule enzymes. It is metabolised primarily within the liver via conjugation with glucuronic acid, the most important substance of bupivacaine is a pair of 6-pipecoloxylidine, that is especially catalysed via haemoprotein P450. Bupivacaine is excreted unchanged with the excretory products.[30]. The period of action is prolonged by administration of vasoconstrictor (1:2000000). However, bupivacaine with vasoconstrictor or alternative vasopressor shouldn't be used concomitantly with ergot type medicine, as a result it can cause severe persistent cardiovascular complication. Likewise, solutions of bupivacaine containing vasoconstrictor, ought to be used with extreme caution in patient receiving MAOI, antidepressant, triptyline or tricyclic antidepressants as it can cause cardiovascular diseases. Bupivacaine is been used with success over the years since the introduction and has become the yardstick for all the alternative long-acting anaesthetics. At low concentration it has propensity for sensory block and gently scotch the motor blocks.

This property allows for 'walking epidural' in labour analgesia. The maximum recommended dose is 2mg/kg with or without adrenaline as there is only a modest increase in duration of action when combined with a vasoconstrictor.

## Pharmacodynamics:

Bupivacaine, a local anaesthetic agent, is indicated for the production of local or regional anaesthesia or analgesia for surgery, for oral surgery procedures, for diagnostic and therapeutic procedures, and for obstetrical procedures.

## Mode of action:

Bupivacaine blocks the generation and the conduction of nerve impulses, presumably by increasing the threshold for electrical excitation in the nerve, by slowing the

propagation of the nerve impulse, and by reducing the rate of rise of the action potential. In general, the progression of anesthesia is related to the diameter, myelination and conduction velocity of affected nerve fibers. Specifically, the drug binds to the intracellular portion of sodium channels and blocks sodium influx into nerve cells, which prevents depolarization.

Several studies have been conducted using various agents and strategies in an effort to reduce postoperative pain and to the best of our knowledge those studies have been reviewed and summarized below:

**Sanaz jowkar**[72] and his colleagues in the year 2022 have reported the result of continuous injection of bupivacaine through a catheter within the surgical wound on reducing the post operative pain of lumbar spine fusion surgeries. In their study , they enclosed 31 patient undergoing non traumatic lumbar spine stabilization surgery and they were randomly allotted to receive (n=15) and doesn't receive (n=16) bupivacaine through a catheter within the surgical wound , postoperatively. Pain intensity (NRS), dose of needed morphine, and drug related complications among patients for 24 hrs were assessed and compared by mann-whitney and freelance t-test. The observation of their study revealed that mean pain intensity was considerably lower within the case cluster over the first postoperative hour in the post operative room($p<0.001$), which continued for the first 2 hours after entering the ward. The mean morphine intake was lower within the bupivacaine cluster throughout the first post operative 24 hours ($16 \pm 0.88$ vs. $7.33 \pm 0.93$ mg, $p < 0.001$). The two groups were not significantly different regarding drug-related complications. Therefore, the authors have concluded that continuous intra-incisional infusion of bupivacaine helped better pain reduction throughout initial operative hours whereas reducing morphine consumption.

**Luque Oliveros M, Morilla Romero de la Osa R**[73] in the year 2021 have evaluated the effectiveness of wound infiltration with 0.5% bupivacaine for pain management within the immediate post operative in patients that underwent cardiac surgery with sternotomy. The study was performed using a single-centre nonrandomized experimental style to gauge a prospective cohort of patients recruited from June to December of 2017. A single-centre study with a non-randomized experimental study compared the pain perceived by 137 patients undergoing to cardiac surgery within

which 68 patients who received infiltration of bupivacaine and 69 patients received infiltration with saline solution. Pain measures were made with the numeric rating scale (NRS) at 2, 12, 24, and 48 hours. Socio-demographic and clinical variables were included too and descriptive, bivariate, and multivariate logistic regression analyses were performed. The authors have found a statistically vital distinction between the means of the NRS scores in favor of the intervention group. Cohen's showed a significant effect size. NRS scores were grouped into NRS ≥4 or NRS <4 and similar results were found. Multivariate logistic regression analyses showed the absence of confounding factors that could call results into question. The authors have concluded that subcutaneous infiltration of 0.5% bupivacaine in the surgical site of patients who have undergone cardiac surgery showed clinically and statistically significant pain relief compared with patients who received saline infiltration throughout the first 12 hours after surgery. This intervention provides promising preliminary results that, alone or in conjunction with other nursing interventions, could constitute an important therapeutic tool for this area of nursing clinical practice.

**Harleen K sandhu , et al, (2021)**[74] compared the effectiveness of single-administration normal bupivacaine vs liposomal bupivacaine in patients undergoing truncal incisions as randomized clinical trial enrolled patients undergoing sternotomy, thoracotomy, minithoracotomy, and laparotomy from one single cardiovascular surgery department in an academic medical center between November 2012 and June 2018. The study was powered to sight a Cohen effect size of 0.35 with a power of greater than 80%. Data analysis was performed from July to December 2018.The patients were randomized to standard bupivacaine or liposomal bupivacaine. Pain was assessed over 3 postoperative days by the Numeric Rating Scale (NRS). Adjunctive opioids were converted to morphine equivalents units (MEU). NRS scores were compared using Wilcoxon rank-sum (3-day area under the curve) and 2-way nonparametric mixed models (daily scale score) to assess time-by-group interaction. Secondary outcomes enclosed additive opioid consumption.

**R. S. Gupta, et al., (2018)**[75] conducted a study to evaluate the efficacy of intra peritoneal and port site instillation of LA for immediate post-operative analgesia. In this randomized, prospective analytical study 60 patients undergoing elective LC were taken. They were divided into 3 groups. Group A was the control group.

Group B received 20ml of 0.25% bupivacaine infiltrated over port sites at the end of surgery (5ml to each port). Group C received port site along with intraperitoneal instillation of LA in the gall bladder fossa and below the diaphragm after removal of gall bladder. Inj diclofenac 75 mg BD IM was given to all patients postoperatively. Additional dose of analgesics was administered on request. Patients were assessed for intensity of abdominal pain by VAS at 1, 4, 8, 12 and 24 hours post operatively. Analgesic consumption was also recorded. The number of subjects complaining of right shoulder pain in each group and duration of hospital stay for all the patents was also noted. Incisional pain was experienced more than visceral pain post operatively by patients for initial 48 hours. Post operatively there was significantly reduced VAS score, reduced incidence of shoulder pain, reduced consumption of analgesics, and reduced duration of stay in hospital in group C patients where they received combined port site and intra peritoneal infiltration of bupivacaine than group A and B. They concluded that combined technique of infiltration of bupivacaine into port sites along with intra peritoneal space is simple, inexpensive and effective technique to minimize early post-operative pain.

**Paras K. et al., (2017)** [76] conducted a prospective randomized controlled double-blind trial. Total 60 patients undergoing laparoscopic cholecystectomy were taken and they were divided into 3 groups to receive either 20ml of 0.25% bupivacaine subcutaneously at all trocar sites (group A) or 20ml of 0.25% bupivacaine in gallbladder fossa after removal of gall bladder (group B). In group C, 2 techniques were combined. Patents received 20 ml 0.25% bupivacaine instilled over gallbladder fossa after removal of gallbladder with 20ml 0.25% bupivacaine infiltration at the trocar sites. Intensity of the pain was compared by NRS scale post-operatively. At 24 hours, in Group A, 95% of the patients had NRS of 1-3. In group B, 45% of the patients had NRS score 4-6 and 40% of the patients had score between 1-3. In group C, 100% of the patients had a lower NRS score between 1-3. They found that trocar site infiltration of bupivacaine is an effective mode for post-operative analgesia. But additional infiltration of local anaesthetics over the gallbladder fossa after removal of gall bladder does not provide any extra benefit.

**Ghorbani-Abdehgah et al (2017)** [77] conducted a randomized controlled trial. In this trial 100 patients who underwent elective laparoscopic cholecystectomy, were

randomly assigned to receive either intra-peritoneal spray of 15 ml of bupivacaine 0.25% solution over gall bladder bed and infiltration of bupivacaine 0.25% in port 1 to 3 incisions or normal saline in the same manner. Post operatively VAS was used to assess pain. Also administered opioid dose and adverse effects were registered and compared between 2 groups. VAS score, post- operative nausea vomiting and total opioid requirement was significantly lower in bupivacaine group. But shoulder pain was not significantly reduced. They concluded that using bupivacaine for infiltration in ports of LC and liver bed is a good pain relief method and it also reduces opioid use post operatively.

Combination therapy to achieve maximum post laparoscopic pain relief had been investigated by **Jabbour-Khoury et al.** [78] They investigated four different regimens as follows: 1) intra- peritoneal spray of 40 ml bupivacaine 0.25%, 2) intra-peritoneal spray of 40 ml bupivacaine 0.25% mixed with 200 mg ketoprofen, 3) intra-peritoneal spray of 40 ml bupivacaine 0.25% and intravenous injection of 200 mg ketoprofen and 4) injection of 200 mg ketoprofen intravenously. In this study the fifth group was control group who received intra-peritoneal spray of 40 ml normal saline. Authors claimed that in patients undergoing elective laparoscopic cholecystectomy, the combination of intra-peritoneal spray of 40 ml bupivacaine 0.25% and 200 mg intravenous ketoprofen is the best regimen to achieve lower postoperative pain and postoperative vomiting.

The duration of post-operative efficacy of pain relief may vary between different studies as **Castillo-Garza and colleagues** [79] compared analgesic effects of 20cc of 0.5% bupivacaine and 20cc normal saline installed into the gallbladder fossa in patients undergoing laparoscopic cholecystectomy. They proposed that only at 6 hours after laparoscopy, the difference between pain levels was significant.

**Gülsüm Altuntaş, et al., (2016)**[80] conducted a study to compare the efficacy of local anesthetic infiltration over trocar site wounds and local anesthetic instillation intraperitoneally on postoperative analgesia after laparoscopic cholecystectomies. The study was conducted on total 90 ASA I-III patients, aged of 20-70 years posted for elective LC. Same general anesthesia drug regimen was given to all the patients. Patients were divided into 3 groups randomly. Group I was assigned to receive 20 ml of 0.5% bupivacaine infiltrated over trocar sites. Group II was assigned to receive 20

ml of 0.5% bupivacaine intraperitoneally. Group III was control group to receive saline over both the sites. Postoperatively analgesic was given using PCA for 24 hours. VAS score, incidence of PONV, and shoulder pain were evaluated at 1st, 2nd, 4th, 8th, 12th and 24th hours. 50 mg dexketoprofen IV was given when the VAS ≥5. It was observed that VAS score, shoulder pain and total dose of morphine requirement were lower in group I who received LA infiltration in the trocar sites than group I who received intraperitoneal LA and group III control patients. They concluded that local anesthetic infiltration over wounds for trocar entry is more effectiveness to control postoperative pain. Also, it is easier to apply and safer than other analgesia methods.

**Tata. V. S. Ramprasad (2015)**[81] conducted a randomized control trial to evaluate the efficacy of trocar sites and intra-peritoneal administration of bupivacaine for postoperative analgesia. The study was conducted with 60 ASA I - III patients undergoing laparoscopic cholecystectomy. They were randomly allotted into 2 groups. Group B received 30ml of 0.25% bupivacaine at gallbladder bed with 20ml of 0.25 % bupivacaine at trocar sites. Group-S received an equal volume of normal saline. As a result, they observed that installation of bupivacaine intraperitoneally and infiltration over port sites decreased the intensity of pain for 12 hours post operatively and there was less consumption of analgesics also. Total dose of tramadol and diclofenac sodium consumed over 12 hours was significantlylower in group B than to group S ($p < 0.0001$). They came to a conclusion that local anesthetic infiltration is an effective component of multimodal pain management after laparoscopic cholecystectomy.

**Sami Hasson, Firas AL Chalabi (2013)[82]** conducted a comparative study to evaluate the effect of bupivacaine instillation on pain relief in the early post-operative period following laparoscopic cholecystectomy. Total 80 patients were taken. They were divided into two groups: group (A) received 40ml of 0.125% bupivacaine diluted in 60ml of isotonic saline instilled in the sub-diaphragmatic and sub-hepatic spaces after gallbladder removal, the remaining 40ml 0.125% bupivacaine were infiltrated over wounds. Group (B) stood as a control group. The postoperative pain was assessed by VAS at fixed intervals of time. In this study it was found that, intraperitoneal instillation and trocars site infiltration of 0.125% bupivacaine was

beneficial in reducing the intensity of abdominal pain in the early few hours after surgery. There was significantly more pain in study group till 8th hour after that it slowly reduced and at 24th hour it was almost same as control group. So, the main effect of bupivacaine helped reducing the pain during the early few post-operative hours after LC.They found that there was no subsequent increase in VAS score at 12 and 24 hours postoperatively in group A as well as in group B. They came to a conclusion that intraincisional infiltration with bupivacaine is a simple and feasible procedure which significantly reduces postoperative pain.

**Maryam Barkat, et al., (2012)**[83] conducted a randomized controlled trial from 4th December 2012 to 4th June 2013. 100 adult patients of either gender, planned for laparoscopic cholecystectomy for cholelithiasis were enclosed. The clinical & demographic variables were arranged down. 50 patients each were allocated to two groups. Group I (The treatment Group) received 20ml bupivacaine solution (in a dose of 4mg/kg body weight) instilled within right sub diaphragmatic space and another 20ml infiltrated into the port sites, 6ml infiltrated through the wall of abdomen around each midline port site and 4ml administered at the lateral port sites. Group II (The Control Group) received no treatment. Patients were assessed for pain relief at 6 hours post-surgery. In group I, 48 % patients showed effectiveness (in terms of pain relief) to the treatment utilized, whereas in group II, the percentage of such patients (pain relief without any treatment) was 14%. P value was found to be 0 (< 0.05). So, they concluded that intraperitoneal instillation and pre incisional infiltration of bupivacaine during laparoscopic cholecystectomy is an effective treatment choice for postoperative surgical pain management**.**

**Jamil Ahmad, Zubair Ahmad Khan, Aziz Khan (2012)[84]** conducted a RCT to assess the analgesic efficacy of bupivacaine application at port-site and intra-peritoneal infiltration in patients with laparoscopic cholecystectomy. The study was conducted with total 84 patients divided into two groups by randomization. Anaesthetic regimen was same for all the patients.The study group received 40ml of 0.25% bupivacaine intra-operatively below the diaphragm and in the gallbladder fossa and local infiltration at the port sites. Postoperative pain assessment was done at 1, 4, 8, 12, 16 and 24 hours using VAS, which was explained to all the patients preoperatively. The patients had received injection diclofenac 50 mg intramuscular

TDS for the first 24 hours post-surgery. Ketorolac 30 mg intramuscular was used as per patient demand. All the patients from control group required rescue analgesia but less number of patients required analgesia in study group. The study group showed lower VAS score than control group at all postoperative hours. And the difference was statistically significant only till 8$^{th}$ postoperative hour. There were no extra complications observed with the use of bupivacaine in the study group during the hospital stay. Their study showed that local anaesthetic administration over port site and gallbladder bed intraperitoneally reduces postoperative pain for the first 8 hours and also reduces total dose of rescue analgesia.

**Maharjan SK, Shrestha S. (2009)**[85] conducted a double blind study to evaluate the analgesic efficacy of intra-peritoneal and periportal infiltration of bupivacaine after laparoscopic cholecystectomy. Total forty patients undergoing elective laparoscopic cholecystectomy were included in this study. They were randomized into two groups. Group A (n=20) was assigned to receive 40ml 0.25% bupivacaine intraperitoneally plus 20ml 0.25% bupivacaine over four port sites (5ml each) after the surgery. Group B was control group. As rescue analgesic Injection pethidine 50 mg IM was given by patient demand for the first 24 hours post operatively. After analyzing the VAS score between the two groups, it was observed that VAS score was lower in the study group than the control group but it was not statistically significant ($p>0.05$). But total dose of pethidine consumed was significantly less in study group ($p<0.00$). So, they concluded that Intra-peritoneal and periportal injection of bupivacaine is an effective method to decrease pain after laparoscopic cholecystectomy.

**Uzunköy A, Coskun A, Akinci O.F (2006)**[86] conducted a randomized study to evaluate the effectiveness of pre-emptive analgesia on postoperative pain relief after laparoscopic cholecystectomy. 45 patients undergoing laparoscopic cholecystectomy were included and divided into 3 groups randomly. Group 1 received bupivacaine injected into the area of skin incision before trocar entry. Group 2 received bupivacaine injected into skin incision sites after removal of trocar. Group 3 stood as control group. The intensity of pain of the patients was evaluated by the visual analogue scale (VAS) at 1, 4, 12and 24 hours after surgery. Diclofenac sodium 75 mg was given as analgesic to the patients whose VAS $\geq 5$. The daily total analgesic

requirement was calculated in terms of total diclofenac intake/day. It was found that, there was no significant difference in VAS scores between group 1 and 2, but the mean VAS scores of these two groups were significantly lower than the control group 3. The analgesic requirement of the patients in each group was statistically not significant. They concluded that Pre-emptive analgesia is as effective as postsurgical local anaesthetic infiltration in reducing postoperative pain.

## Other methods used for postoperative pain relief:

Various other methods have also been investigated to reduce the postoperative pain after LC. One study was conducted on the use of pre-gabalin for post-operative pain relief after LC.[87].A total of 84 patients were taken initially, out of which 24 patients were excluded due to refusal, chronic analgesic consumption and inability to operate PCA device. 60 patients remained for the study and among them 56 patients completed the study. They were divided into two groups 30 in each group by randomization. The study group received pregabalin 150mg orally before one hour of surgery and the other group stood as control group. No significant difference was found among the two groups in view of demographic data, durationof operation and anesthesia. Post-operatively patients were given fentanyl using PCA. There was lesser VAS score and analgesic requirement seen in study group when compared to control group. No significant difference was found in regard to sedation score and side effects between two groups.

**Sarvestani et. al** [88] used Hydrocortisone for post-operative pain relief. 60 patients were taken in this study and divided into 2 groups to receive 100mg hydrocortisone in 250ml of saline (study group) or only 250ml of normal saline (control group) intra-peritoneally. Two patients were excluded due to conversion to open cholecystectomy was necessary in both cases because of dense inflammatory adhesions. Demographic data and duration of surgery were similar for both the groups ($p > 0.05$). It was observed that, VAS for abdominal pain and shoulder pain were significantly lower in the study group at $6^{th}$, $12^{th}$ and $24^{th}$ hours post operatively. There was no significant difference found between two groups regarding analgesic requirements in the recovery room. But total mepherdine requirement was more in the saline group than the hydrocortisone group ($p=0.00$). Regarding PONV, duration of hospital stay, time of return of bowel function, unassisted ambulation and oral intake was similar for

both the groups.

Other drugs like dexmedetomidine, tramadol and magnesium sulphate have also been added with local anaesthetic agent for intraperitoneal instillation to reduce post-operative pain after laparoscopic cholecystectomy.

**Dr. Mohamad Ommid, et al., (2018)**[89] conducted a study to assess the analgesic effect of the intra-peritoneal administration of intra-peritoneal dexmedetomidine combined with bupivacaine and intra-peritoneal bupivacaine alone in patients undergoing laparoscopic cholecystectomy. 100 patients of ASA I-II of both sexes, aged between 18 - 60 years, were equally divided into two groups randomly using table of randomization. Group B (n = 50) received intra-peritoneal 30ml 0.25% bupivacaine + 5ml normal saline. Group BD(n = 50) received intra-peritoneal 30ml 0.25% bupivacaine + dexmedetomidine 1µg/kg (diluted in 5ml NS). VAS was recorded at 1/2, 1, 2, 4, 6 and 24 hours postoperatively. Incidence of postoperative nausea and vomiting (PONV) and supplementary analgesic and antiemetic consumption were also recorded. It was observed that VAS scores were significantly less in Group BD (2.12±0.91) than Group B (4.21±1.15). Time of first request for analgesic (minutes) was longest in group BD (132±20) than group B (60±19) and total analgesic consumption (mg) was lowest in group BD (48 ± 18) than group B (182 ± 80). They came to a conclusion that using dexmedetomidine along with LA for intra-peritoneal administration provides longer pain free period post-surgery and also helps to reduce total consumption of rescue analgesic agent after LC.

**Anurag Yadava, et al (2016)** [90] conducted a prospective, randomized study. This study compared the quality and duration of post-operative analgesia using intraperitoneal tramadol plus bupivacaine (TB) or magnesium plus bupivacaine (MB) after laparoscopic cholecystectomy. A total of 186 patients belonging to the ASA 1 or 2, of either gender and aged between 18 - 65 years, planned for laparoscopic cholecystectomy were selected for the study and allocated into two groups by method of randomization. Both the groups received following drug as intraperitoneal instillations: 30ml of 0.25% bupivacaine along with 100 mg tramadol (TB group) and 30ml of 0.25% bupivacaine along with 50 mg/kg of MgSO4 (MB group) at the end of surgery. Inj paracetamol 1g IV was given as rescue analgesic on demand or/and with

VAS score>3 up to a maximum dose of 4g in 24 h. VAS score was recorded at 1, 2, 4, 6, 8, 12 and 24 hours postoperatively. The time duration of the first request for analgesic and total paracetamol consumption in 24 h was also recorded. The adverse effects of the studied drugs i.e. nausea vomiting, loss of tendon reflexes and hypotension were also observed during post-operative period at intervals of 30 min, 40 min, 1 h, 2 h, 4 h and 6 h after shifting to recovery room. VAS score after 1, 2, 4, 6 and 24 h of surgery was found significantly more in TB group compared to MB group ($P < 0.05$). The mean time interval of the first rescue analgesia was also significantly longer in MB group compared to TB group ($P < 0.05$). TB group had mild to moderate pain whereas most of the patients in MB group had mild pain in first 24 h of surgery. Total paracetamol consumption in 24 h was also less in MB group than TB group. It was evident that the addition of $MgSO_4$ to bupivacaine decreased post-operative pain and analgesic consumption in first 24 hours after surgery along with longer pain free period after laparoscopic cholecystectomy.

**Induseela et al., in 2018**[91] done a randomized comparison of ultrasound-guided bilateral subcostal transversus abdominis plane block(T) AND port site infiltration(I)with 20ml of 0.25% bupivacaine .40 each grp in the lap. Cholecystectomy under general anesthesia. Vas scores recorded >4 or when a patient complains of pain. Time to the first analgesia mean +SD in Group I AND GROUP T was 292.7 +_ 67.03 and 510.3+ 154.55 and mean tramadol required was 141.8+ 60.01 mg and 48.69 +36.14mg respectively. Mean vas was significantly lower in group T.USG guided subcostal tap block provides superior postoperative analgesia than port-site infiltration.

**Tolchard et al., in 2012**[92] reported the efficacy of using subcostal tranversus abdominis plane block in lap cholecystectomy with port-site infiltration in 43 Patient. Vas scores were measured in 1 and 4 hour and opioid requirement and up to 8hour postoperative. The time was recorded from discharge to recovery. STA block resulted in a significant reduction in serial vas and reduced fentanyl requirement in recovery >35%. Compared to group received local port site infiltration median 0.9 vs 1.5mcg/kg. STA BLOCK was a nearly 50% reduction in overall 8hour morphine consumption. STA BLOCK significantly reduced the median time to discharge from recovery from 110 mins to 65 mins. The result suggests STA block provides superior

postoperative analgesia and reduces opioid requirement following lap. Cholecystectomy.

**Vladimir et al.**,[93] conducted a randomized study with 76 patient undergoing lap cholecystectomy receive STA n=38 and standard postoperative analgesia n=38 group T receive 20 ml of 0.33% bupivacaine and other groups receive tramadol 1mg/kg/6hour. vas score recorded for 6hour postoperative. Subcostal tap reduced postoperative pain scores compared to standard analgesia tramadol consumption was lower in STA. 24.29 + 47.54g than standard analgesia group 270.2 + 81.9g. STA provides superior postoperative analgesia and reduction in opioid requirement after lap. Cholecystectomy.

**Arghya Mukherjee et al., 2016**,[94] USG guided oblique subcostal transversus abdominis plane block an observational study, new and promising analgesia technique done in 30 Patient. Usg guided STA block 20ml of 50:50 mixture of bupivacaine 5mg/ml and lignocaine 21mg/ml. vas scores were recorded >3, rescue analgesia fentanyl 0.5mcg/kg for 2hour and every 6 hour until 24hour. median vas scores was below 3 in 83% patient and number of fentanyl 37% patient, 50% required for 2, 63% patient vas score <3 was 12.18 and 17% analgesia <12hour. The profound analgesia coverage of oblique subcostal within 24hour postoperative analgesia for upper abdominal surgery.

**Caius Mihai 2016,** [95] DONE A efficacy of oblique subcostal transversus abdominis plane block in lap cholecystectomy a prospective placebo study. 60 patient randomized GROUP S TAP WITH SALINE AND GROUP P TAP WITH O.25% BUPIVACAINE. The quality of analgesia by vas score at a specific interval during 24 hours. The mean 24hour opioid consumption between-group 32+ 26.5mg vs 79+16.6mg, P <0.001. PACU stay was lower for Group P compared with Group S. OSTAP block with bupivacaine 0.25% can provide superior analgesia up to 24 hour after lap cholecystectomy when compared with multimodal analgesia regimen.

**Eldawlatly et al., 2009[96]** conducted the prospective randomized and double-blinded study which was designed to describe a method of ultrasound-guided tap block and to gauge the post operative analgesic effectivity in patient undergoing lap cholecystectomy under general anesthesia with or without Tap block. 42 patient

undergoing lap cholecystectomy were randomized to receive general anesthesia either with Group S N=21 or without TAP block group B N=21. Ultrasound-guided tap block was performed with 15ml of 5mg/ml of bupivacaine on both sides. Intraoperative use of sufentanil and post operative demand of morphine employing a patient-controlled analgesic device were recorded. GROUP S received considerably additional intraoperative sufentanil and postoperative morphine than Group P MEAN SD 8.6(3.5) vs 23.0 (4.8mg), P<0.01 and 10.5(7.7) vs 22.8(4.3) mg, P <0.05. They concluded that USG enables exact placement of local anesthetic for TAP BLOCK. In lap cholecystectomy under general anesthesia, USG guided tap block substantially reduced the perioperative opioid consumption.

**Uma Srisvastava et al., 2015**[97] conducted in 62 parturient undergoing cesarean section were randomized double blinded receive bilateral transversus abdominis plane block at end of surgery by spinal anaesthesia. 20ml of 0.25% bupivacaine tap block given in one group or no TAP block, in addition, 75mg diclofenac 8 hours and I.v patient-controlled analgesia I.v tramadol. Every patient was examined at 0, 4, 8, 12, 24 and 48hour postoperatively by vas score. The first demand for tramadol, total consumption of tramadol and side effects were recorded. use of tramadol was reduced inpatient given TAP BY 50% compared with the patient given no block during surgery P<0.001. Pain score was lower both in rest and activity at P<0.001. TAP was effective analgesia with a substantial reduction in INJ. Tramadol uses during 48 hours after caesarean section when used adjunctive to standard analgesia.

**Niraj et al., 2011**[98] conducted a comparison of analgesic efficacy of subcostal transversus abdominis plane block with epidural analgesia following upper abdominal surgery under general anesthesia. Randomized subcostal transversus abdominis block catheter n=29 or epidural analgesia n=33 in addition to standard postoperative analgesia regular paracetamol I.v and tramadol was given. The TAP GROUP receive bilateral 1mg /kg bupivacaine 0.375% bilaterally every 8hourly. The epidural group receive an infusion of bupivacaine 0.125% with fentanyl 2mcg/ml. the primary outcomes measures by vas score at 8, 24, 48,72 after surgery. We found a significant difference in median vas during coughing at 8 hours between tap group 4.0 (2.3-6.0) and epidural group 4.0 (2.5-5.3) and at 72 hour 2.0(0.8-4.0) and 2.5 (1.5-5.0) respectively. Subcostal transverse plane block catheter bolus may be an effective

alternative to epidural analgesia after upper abdominal surgery.

**Bharti et al. done in 2011**[99] randomized 40 patients undergoing colorectal surgery to standard treatment (diclofenac and intravenous morphine) and bilateral intraoperative TAP block with either 0.25% bupivacaine (n = 20) or saline (n = 20). The bupivacaine group had a significant reduction in 24-hour morphine requirements (6.45 ± 3.26mg versus 17.55 ± 5.78mg; P<0.0001) as well as a significant reduction in early postoperative pain scores both at rest and with coughing. Furthermore, early postoperative sedation scores were significantly lower in the bupivacaine group, and patient satisfaction was higher (6.8 ± 1.1mg versus 3.5 ± 1.5mg; P<0.001). There was no significant difference between groups in the incidence of PONV. Patients in the control group experienced significantly more severe PONV, requiring pharmacological intervention.

**Hivelin et al**.[100] studied the impact of TAP blocks for post operative pain management in patients with abdominal deep inferior epigastric perforator flaps for breast reconstruction. The TAP block group (n = 15) required significantly less morphine (median and interquartile range: 28mg (27mg– 38mg) versus 42mg (36mg–46mg); P = 0.0057) than controls (n = 15) in the first 24 hours after surgery. Early postoperative numerical pain scale scores were also significantly lower in the TAP block group compared to the non-TAP-block patients. However, no difference was observed between groups for postoperative sedation, PONV and 48-hour satisfaction with pain management.

In another study, **Baaj et al.**[101] randomized 40 women to receive either local anesthetic (n = 20) or saline (n = 20) for TAP blocks in addition to a plain bupivacaine spinal block for elective caesarean section. A significant reduction in 24-hour morphine requirement was observed in the local anesthetic TAP block group versus controls (26mg ± 5mg versus 63mg ± 5mg; P<0.05).

A study was done **by Beena et al., 2013**[102] to assess the analgesic effectuality of ultrasound-guided transverse abdominis plane block for retro peritoneoscopic donor nephrectomy. During this prospective randomized double-blind procedure, 60 patients undergoing laparoscopic donor nephrectomy were at random divided into two groups by closed envelope methodology. At the end of the surgery, ultrasound-guided

transverse abdominis plane block was given to the patients of each group. Study cluster (group S) received Injection Bupivacaine (0.375%), whereas the control cluster (group C) received normal saline. Inj. Tramadol (1 mg/kg) was given as rescue analgesic at visual analogue scale over 3 in any Group t rest or on movement. The analgesic effectuality was assessed by visual analogue score each at rest and on movement, time to the primary dose of rescue analgesia, cumulative dose of tramadol, sedation score, and nausea score, which were also noted at 30 min, 2, 4, 6, 12, 18, and 24 h postoperatively. Total tramadol consumption at 24 h was conjointly assessed. This concluded that patients in group S had significantly lower Visual analogue score, longer time to the first dose of rescue analgesia (547.13±266.96 min vs. 49.17±24.95 min) and lower tramadol consumption (103.8±32.18 mg vs. 235.8±47.5 mg) in 24 hours.

**Niraj et al, 2009**[103] studied the analgesic effectivity of TAP block in patients undergoing open appendectomy during a randomized controlled double-blinded clinical trial. Fifty-two adult patients undergoing open appendectomy were randomized to undergo standard care (n=26) or to undergo a right-sided TAP block with bupivacaine (n=26). Additionally, all patients received patient-controlled IV morphine analgesia, regular acetaminophen, and non-steroidal anti-inflammatory drug, as needed in the post operative period. All patients received standard anesthesia, and after induction of anesthesia, the TAP group received an ultrasound-guided unilateral TAP block. Ultrasound-guided TAP block considerably decrease the postoperative morphine consumption in the first 24 h [mean (SD) 28 (18) vs 50 (19) mg, P<0.002]. Postoperative visual analogue scale pain scores were also reduced in the TAP block group just after surgery [median (IQR) 4.5 (3–5.3) vs 8.5 (7.5–10), P<0.001] and at 24 h [5.2 (4–6.2) vs 8 (7–8.5), P<0.001. Ultrasound-guided TAP block holds considerable promise as a part of a balanced postoperative analgesic modality for patients undergoing open appendectomy.

**McDonnell et al, 2007**[104] conducted a randomized double-blind case-control study in thirty-two adults undergoing large bowel resection via a midline abdominal incision to receive standard care, including patient-controlled morphine analgesia and regular non-steroidal anti-inflammatory drugs and acetaminophen (n=16), or to undergo TAP block (n=16) in addition to standard care (n=16). After induction of

anesthesia, 20 ml of 0.375% levobupivacaine was deposited into the transversus abdominis neuro-fascial plane via the bilateral lumbar triangles of Petit. TAP block reduced visual analogue scale pain scores (TAP versus control, mean ± SD) on emergence (1±1.4 vs 6.6±2.8, $P<0.05$), and at all postoperative time points, including at 24 h (1.7±1.7 vs 3.1±1.5, $P<0.05$). Morphine requirements in the first 24 postoperative hours were also reduced (21.9±8.9 mg vs 80.4 ±19.2 mg, $P<0.05$). They concluded that TAP block provided highly effective postoperative analgesia in the first 24 postoperative hours after major abdominal surgery.

# MATERIAL AND METHODS

**Study design:** Hospital based prospective, randomized comparative study.

**Study Place:** The study was conducted between the period of August 2021 and July 2022 at the Department of Anaesthesiology, Santosh Medical College and Hospital, Santosh Deemed to be University, Ghaziabad, UP.

**Study Population:**

Adult patients of both the sex, ASA physical status I-II, admitted in Santosh Hospital and scheduled for laparoscopic cholecystectomy who meet eligibility criteria were enrolled for the study. The patients were randomly assigned either to the bilateral subcostal TAP block group or to those receiving intraperitoneal instillation of bupivacaine.

**Inclusion Criteria:**

- ASA physical status I-II
- Age more than 18 years but less than 65 yrs.
- Either sex
- BMI more than 18 or less than 35

**Exclusion Criteria:**

- Patient's refusal
- Pregnancy
- Allergy to local anesthetics
- Alcohol or drug abuse
- Chronic opioid intake
- Consumption of any pain killers within the 24hr before the surgery
- Infection at injection site
- Coagulation abnormality
- Severe psychiatric disorder

**Methods:**

After obtaining approval from institutional ethics committee of Santosh Deemed to be University, Ghaziabad, 60 adult patients those agreed to give their consent from both the genders belonging to ASA grade I and grade II admitted to Santosh Medical College & Hospital, Ghaziabad, for elective surgery under general aesthesia were randomly divided into 2 groups of 30 in each. Selection of patients to the current study was strictly adhere with the inclusion criteria. Patients those were not met the required inclusion criteria were excluded from the study. The selected patients were randomly divided into two groups as follows:

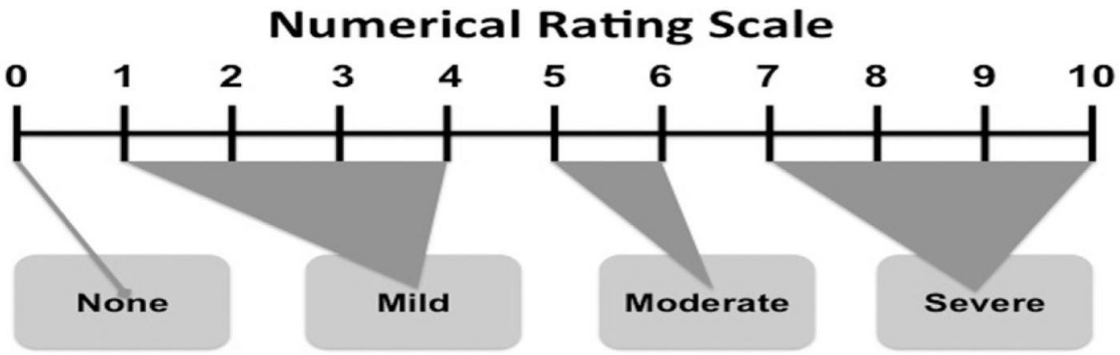
Group A: Patients receiving USG guided tap block before surgery performed by trained anaesthetists.

Group B: Patients receiving 40 ml of 0.25 % bupivacaine after surgery, instillation done by surgeon intraperitoneally at gall blabber bed and under the domes of diaphragm under direct vision.

**Pre-anaesthetic Check-Ups**

A thorough pre-anaesthetic examination was done a day before the surgery and written informed consent was taken from all the patients. Routine physical examination of all patients was carried out. Airway examination including MPG grading, Mouth opening were also done. All routine haematological, biochemical & radiological investigations, electrocardiogram appropriate for the surgery were carried out. A pre-operative visit was made to allay the anxiety and to develop a good rapport. The patients were instructed to fast overnight and aspiration prophylaxis and were advised with Tab Rantac 150 mg and Tab alprazolam 0.25 mg night before surgery NRS pain score was explained to all the patients and information was given regarding pain scoring system ranging from 0 to 10 for determination of severity.

Numerical Rating Scale (NRS): having the anchors of "No Pain" and "Worst Pain" that would be rated from 0 through 10, i.e., making a 10 point scale as shown in the below picture the pain was also assessed in patients.




**Procedure:** Patients were randomly divided into two equal-sized (n = 30) study groups. Group A patients received USG guided STA block with 0.25% levobupivacaine both sides, and Group B patients received 0.25% levobupivacaine through the intraperitoneal route.

On arrival to the operation theatre, intravenous line was established with 18G cannula and standard ASA recommended monitoring was done with 5-lead electrocardiogram, non-invasive blood pressure, finger pulse oximetry, and end-tidal carbon dioxide (CO2) in all patient. A standardized general anaesthetic regime was employed in all patients, consisting of propofol 3mg/kg, fentanyl 2 μg/kg, and vecuronium 0.1 mg/kg, and intraoperative anaesthesia was maintained with 70% nitrous oxide, 30% oxygen, and1% isoflurane. At the end of surgery, all patients were given analgesia with paracetamol 15 mg/kg and neuromuscular block was reversed with standard doses of neostigmine and glycopyrrolate.

For Group 1, the STA block was given under ultrasound guidance; the probe was placed below the xiphisternum and moved laterally along the subcostal margin to the anterior axillary line. A 1 00-mm, 22G block needle was then guided just inferior to the right costal margin at the anterior axillary line such that the tip lay between the transversus abdominis and internal oblique muscle within the neurovascular plane. Following aspiration, a volume of 20 ml of 0.25% levobupivacaine was injected, and the same procedure was repeated on the other side. After ascertaining patient's eligibility, STA block was given by the same trained anaesthesiologist in Group 1 an intraperitoneal levobupivacaine in Group 2 in all the study

patients. Data were collected in postanaesthetic care unit by another anaesthesiologist who did not know which patient has received STA block or intraperitoneal instillation.

For Group 2, at the end of surgery and before the removal of trocars, 40 ml of 0.25% levobupivacaine diluted in normal saline was instilled by the surgeon intraperitoneally at gallbladder bed and under domes of both diaphragms under direct vision. The pressure of the gas insufflation was kept within 10–12 mm Hg in all patients. At the end of surgery, CO2 was evacuated, and intraperitoneal anaesthetic solution was left in situ.

**Statistical Analysis:**

In the present study, we have evaluated the analgesic efficacy and opioid-sparing effect of subcostal transversus abdominis plane block in laparoscopic cholecystectomy for postoperative pain relief, the observation and results were analysed. The collected data were analysed with IBM.SPSS statistics software 23.0 Version. To describe the data descriptive statistics frequency analysis, percentage analysis was used for categorical variables and the mean & S.D were used for continuous variables. To find the significant difference between the bivariate samples in independent groups the Unpaired sample t-test and the Mann-Whitney U test was used. The significance between the groups for categorical data Chi-Square test was used. In all the above statistical tools the probability value > .05 was considered as significant level.

# RESULTS

**TABLE 1:**

| Preoperative | Group 1 (Mean±SD) | Group 2 (Mean±SD) | t value | p value |
|---|---|---|---|---|
| PR | 87.7±10.3 | 92.23±9.17 | 1.801 | 0.076 |
| RR | 16.3±1.47 | 16.87±1.07 | 1.708 | 0.093 |
| SBP | 120±3.48 | 121.2±3.88 | 1.260 | 0.212 |
| DBP | 80.13±2.16 | 80.93±2.61 | 1.292 | 0.201 |
| SPO2 | 98.7±0.84 | 98.5±0.62 | 1.046 | 0.299 |

**Unpaired t test**

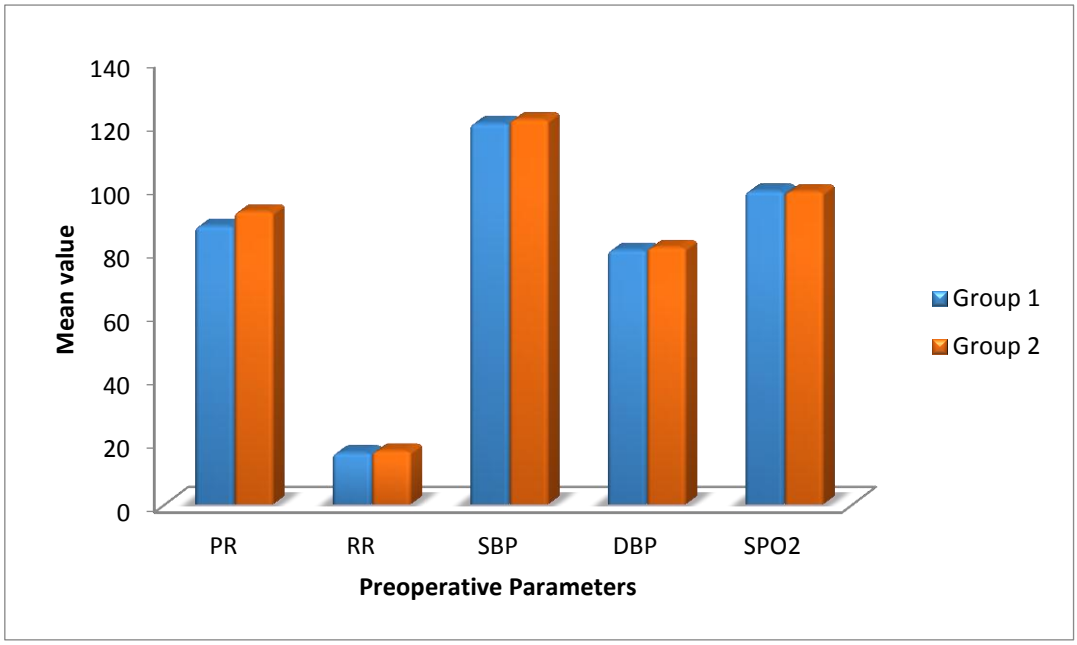



Table 1 demonstrate preoperative vitals including pulse rate, respiratory rate, systolic BP, diastolic BP and SPO2 calculated by using unpaired t test. The mean SD of PR in group 1 and group 2 was 87.7±10.3 and 92.23±9.17. the mean SD of RR in group 1 and group 2 was 16.3±1.24 and 16.87±1.07. The mean SD of SBP was 120±3.48 and 121.2±3.88. The mean SD of DBP was 80.13±2.16 and 80.93±2.61. The mean SD of SPO2 was 98.7±0.84 and 98.5±0.62 in group 1 and group 2 respectively. Preoperative vitals are statistically insignificant as p values of PR,RR,SBP,DBP and SPO2 in both the groups are 0.076,0.093,0.212,0.201,0.299.

**TABLE 2:**

| Age (yrs) | Group 1 | | Group 2 | |
|---|---|---|---|---|
| | N | % | N | % |
| 19-30 | 5 | 16.67 | 7 | 23.33 |
| 31-40 | 10 | 33.33 | 9 | 30.00 |
| 41-50 | 12 | 40.00 | 10 | 33.33 |
| 51-60 | 3 | 10.00 | 2 | 6.67 |
| ≥61 | 0 | 0.00 | 2 | 6.67 |
| Median | 41 | | 40 | |
| Range | 19-60 | | 23-71 | |
| Mean±SD | 40.63±9.15 | | 41.00±11.65 | |
| t & p value | 0.135, 0.892 (NS) | | | |

**Unpaired t test**

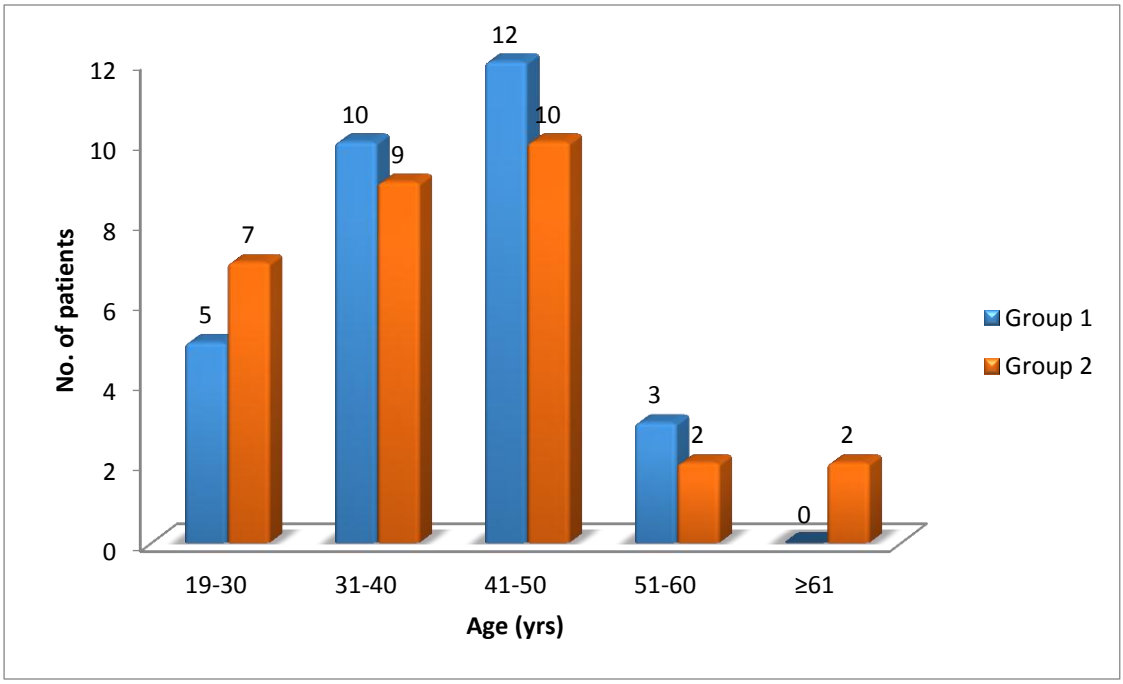



Table 2 demonstrates the age distribution and that unpaired t test is used to analyse the data. The mean age of patients in Group 1 was 40.63±9.15 and the mean age in Group 2 was 41.00±11.65. The two groups were comparable with respect to age as

the difference was not statistically significant as p value is 0.135, and t value is, 0.892. The majority of our patients were in between 30 – 40 years of age.

**TABLE 3:**

| Gender | Group 1 | | Group 2 | |
|---|---|---|---|---|
| | N | % | N | % |
| Male | 8 | 26.67 | 8 | 26.67 |
| Female | 22 | 73.33 | 22 | 73.33 |
| Total | 30 | 100.00 | 30 | 100.00 |

**Chi square 0.000, P value 1.000 (NS)**

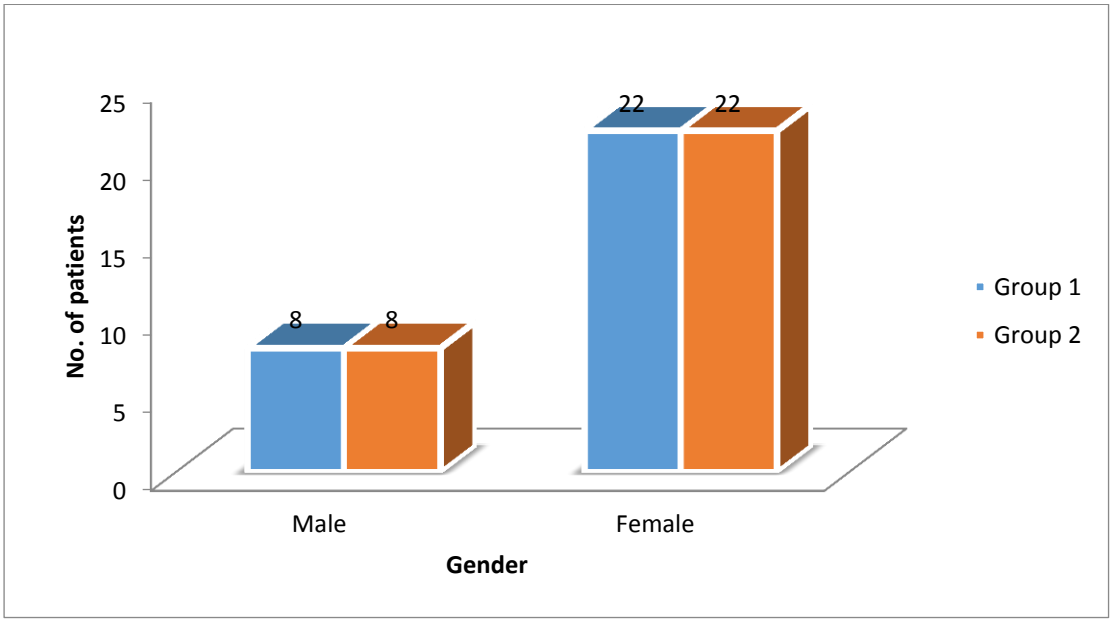



Table 3 shows the distribution according to sex and chi square test for analysis. Out of the total 30patients in Group 1, 26.67 % were males & 73.33 %were females and out of total 30 patients in Group 2, 26.67 %were males and 73.33 % were females. When compared the difference between the two groups it was not found to be statistically significant (p=1.000)

**TABLE :4**

| BMI (kg/m2) | Group 1 | | Group 2 | |
|---|---|---|---|---|
| | N | % | N | % |
| <18.5 | 0 | 0.00 | 0 | 0.00 |
| 18.5-24.9 | 28 | 93.33 | 27 | 90.00 |
| 25-29.9 | 2 | 6.67 | 3 | 10.00 |
| ≥30 | 0 | 0.00 | 0 | 0.00 |
| Median | 21.4 | | 21.91 | |
| Range | 18.60-29.20 | | 18.80-29.40 | |
| Mean±SD | 21.83±2.43 | | 22.31±2.57 | |
| t & p value | 0.741, 0.461 | | | |

**Unpaired t test**

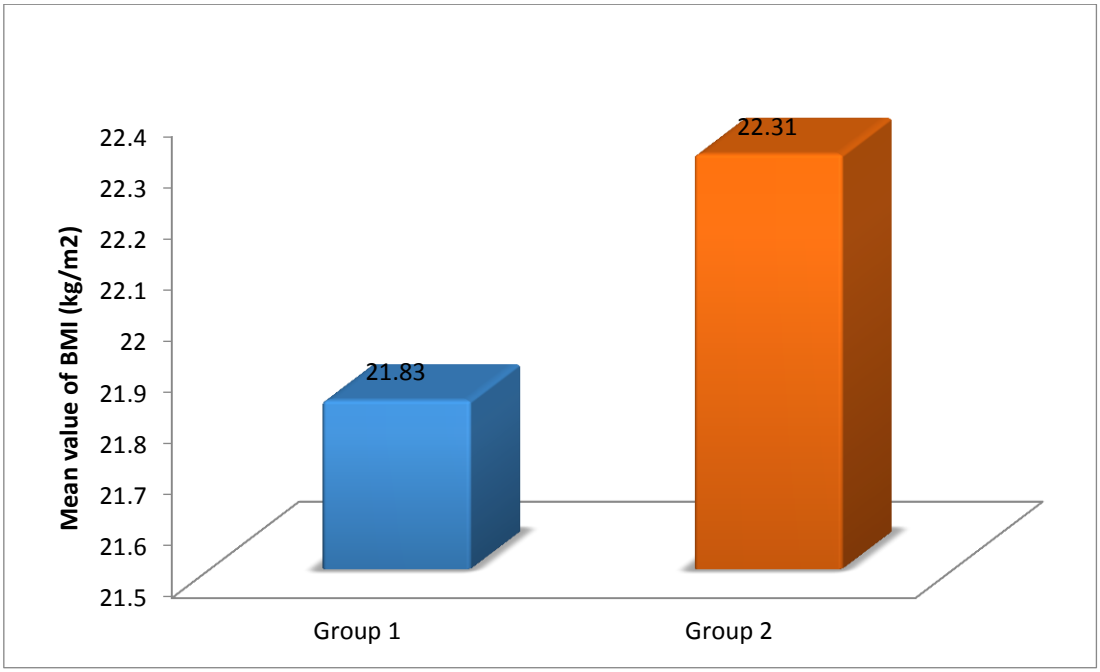



Table 4 demonstrates the distribution according to BMI and unpaired t test is used for analysis. The mean BMI in Group 1 was 21.83±2.43 and mean BMI in Group 2 was 22.31±2.51. There was no statistically significant difference between the two groups as p value is 0.741and t value is 0.461.

**TABLE 5:**

| ASA | Group 1 | | Group 2 | |
|---|---|---|---|---|
| | N | % | N | % |
| I | 28 | 93.33 | 27 | 90.00 |
| II | 2 | 6.67 | 3 | 10.00 |
| Total | 30 | 100.00 | 30 | 100.00 |

**Fisher exact test, P value 1.000 (NS)**

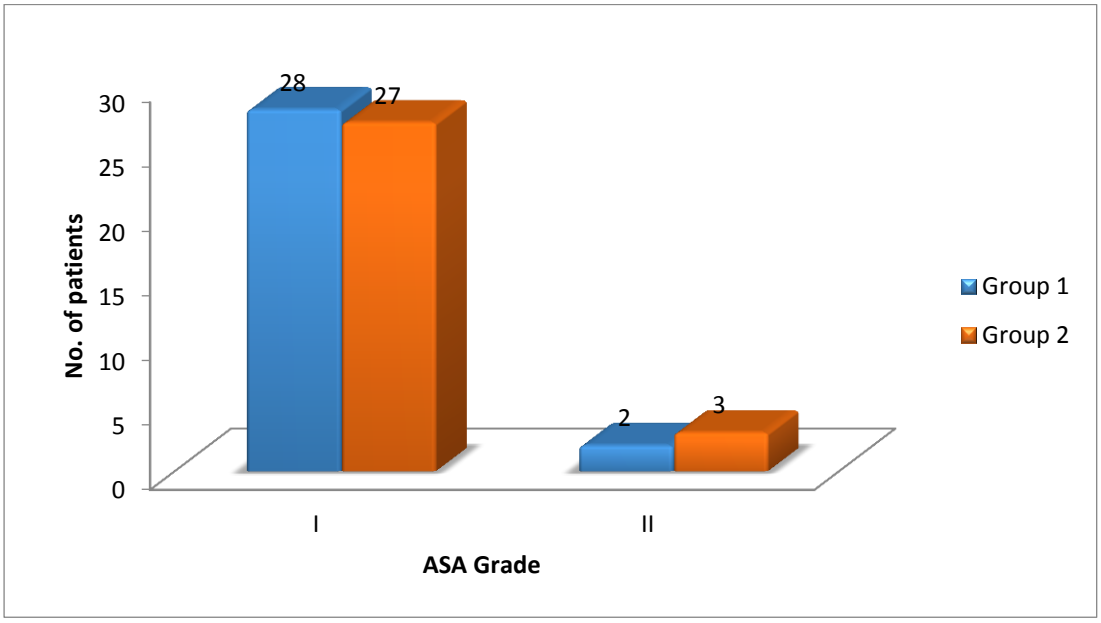



Table 5 demonstrates distribution according to ASA grading and data is analysed using fisher exact test. In group 1, 28 patients belonged to ASA Grade I and 2 patients in ASA Grade II, whereas in Group 2, there were 27 patients in ASA Grade I and 3 patients in ASA Grade II. The difference in both the groups were not statistically significant as p value is 1.000.

**TABLE 6:**

| Complications | Group 1 | | Group 2 | | p value |
|---|---|---|---|---|---|
| | N | % | N | % | |
| Nausea | 8 | 26.67 | 9 | 30.00 | 0.774 |
| Vomiting | 0 | 0.00 | 4 | 13.33 | 0.112 |
| STP | 3 | 10.00 | 2 | 6.67 | 1.000 |

**Chi square test & Fisher exact test**

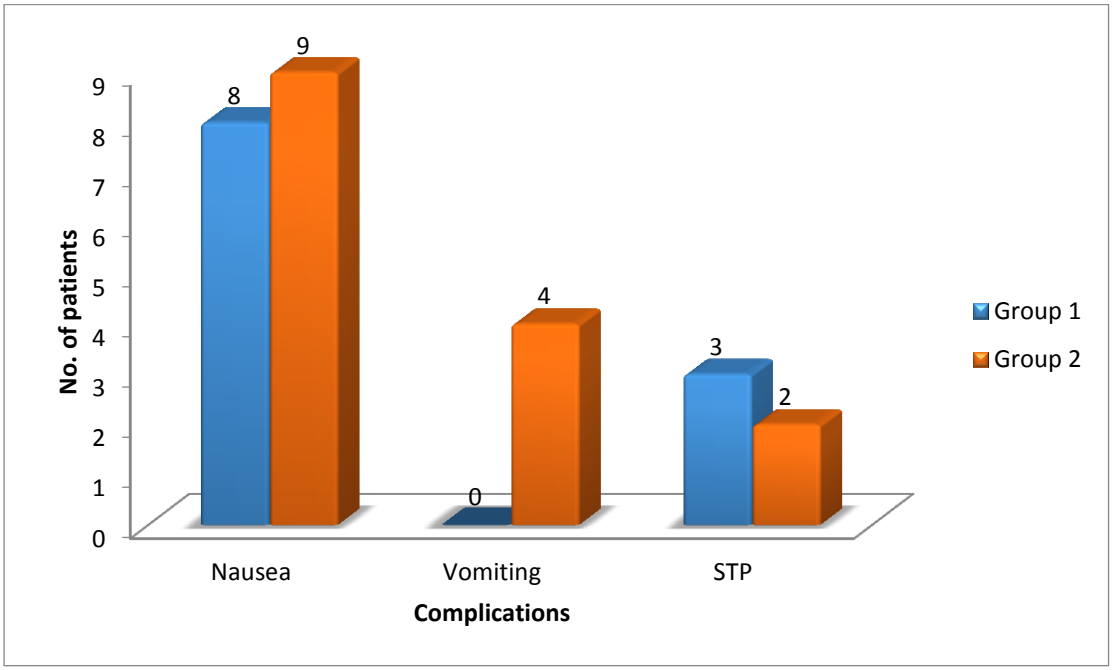



Table 6 demonstrates the distribution according to postoperative nausea, vomiting and shoulder tip pain, the data is analysed by chi square test and fisher test. It is shown that in group 1 8 (26.67%) patients complained of nausea, 0 (0.00%) patients complained of vomiting and 3 (10.00%) patients complained of shoulder tip pain. In group 2, 9 (30%) patients complained of nausea, 4 (13.33%) complained of nausea and 2(6.67 %) complained of shoulder tip pain. No statistically significant difference was found among the groups in terms of frequency of nausea, vomiting and shoulder tip pain as p values was 0.774, 0.112, 1.000 for nausea , vomiting and shoulder tip pain.

**TABLE 7:**

| Patients satisfaction | Group 1 | | Group 2 | |
|---|---|---|---|---|
| | N | % | N | % |
| Yes | 17 | 56.67 | 6 | 20.00 |
| No | 13 | 43.33 | 24 | 80.00 |
| Total | 30 | 100.00 | 30 | 100.00 |

**Chi square 8.531, P value 0.003 (S)**

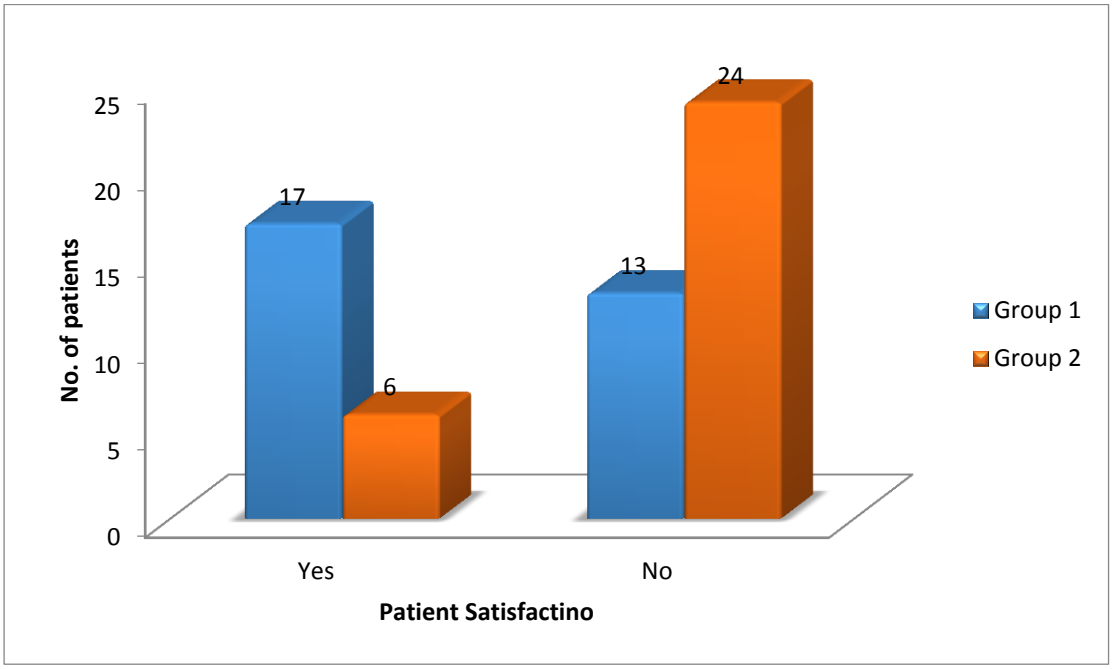



Table 7 demonstrate patient overall satisfaction, it was analyzed by using chi square test, in group 1 17 (56.67 %) patients were satisfied and 13 (43.33%) were not satisfied. In group 2, 6 (20.00%) were satisfied and 24 (80.00%) patients were not satisfied. It is statistically significant as p value is 0.003.

**TABLE 8:**

| Time | | Rescue Analgesia | | | | P value |
|---|---|---|---|---|---|---|
| | | Group 1 | | Group 2 | | |
| | | N | % | N | % | |
| 6 hrs | Received | 3 | 10.00 | 12 | 40.00 | **0.007** |
| | Nil | 27 | 90.00 | 18 | 60.00 | |
| 12 hrs | Received | 1 | 3.33 | 9 | 30.00 | **0.012** |
| | Nil | 29 | 96.67 | 21 | 70.00 | |
| 24 hrs | Received | 0 | 0.00 | 6 | 20.00 | **0.023** |
| | Nil | 30 | 100.00 | 24 | 80.00 | |

**Chi square & Fisher exact test**

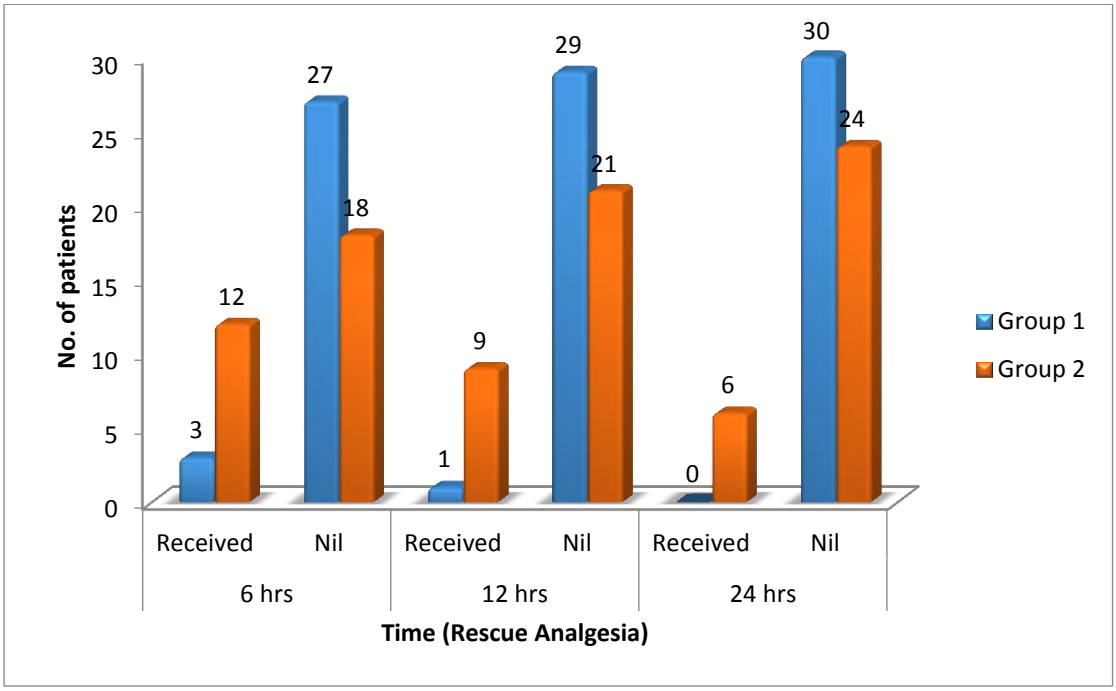



Table 8 demonstrate rescue analgesia received by patients of both the groups at 6, 12 and 24 hours. In group 1, 3 (10.00%) patients received and 27 (90.00%) not received rescue analgesia at 6hrs. in group 2, 8 (26.67%) patients received and 22 (73.33%) not received analgesia at 6hrs. In group 1, 1 (3.33%) received and 29 (96.67) patients not received analgesia at 12 hrs. In group 2, 4(13.33%) received and 26(86.67%) not received analgesia at 12hrs. In group 1 0(0.00%) patient received and 30(100%) patients not received analgesia at 24hrs. In group 2, 6 (20.00) patients received and 24

(80.00%) not received analgesia at 24hrs. The data is statistically significant as p value at 6hrs is 0.007, at 12hrs 0.012 and at 24hrs is 0.023.

**TABLE 9:**

| Time | NRS | | p value |
|---|---|---|---|
| | Group 1 (Mean±SD) | Group 2 (Mean±SD) | |
| 0h | 0.33±1.06 | 1.07±1.6 | 0.079 |
| 1h | 0.3±1.15 | 1.6±1.75 | **0.003** |
| 2hrs | 0.6±1.38 | 2.7±2.1 | **0.0004** |
| 4hrs | 1.8±1.54 | 3.3±1.84 | **0.003** |
| 6hrs | 2.93±1.89 | 5.17±1.26 | **<0.0001** |
| 8hrs | 3.1±1.52 | 4.63±1.56 | **0.0002** |
| 12hrs | 2.63±1.94 | 4.63±1.71 | **0.0002** |
| 24hrs | 3.13±1.55 | 4.87±1.7 | **0.0002** |

**Mann Whitney U test**

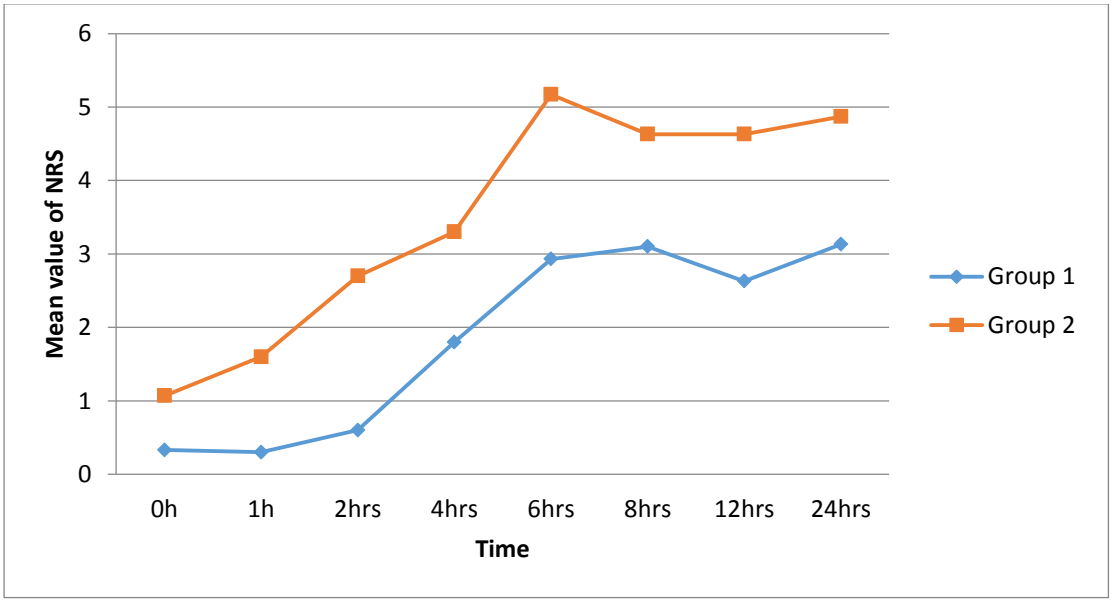



Table 9 shows the distribution according to NRS score for abdominal pain and for data analysis mann whitney u test is used. Both the two groups experienced a gradual reduction in pain after laparoscopic cholecystectomy, as evidenced by NRS scores

and the need of analgesics. This difference was reported from 0 hour till 24 hours post-operatively. At 0 post-operative hour, the mean NRS score for abdominal pain of group 1 and 2 was 0.33±1.06 and 1.07±1.6 respectively, there was no statistical significance as p value was 0.079. NRS at 1 hour, the mean NRS score for abdominal pain of group 1 and 2 was0.3 ±1.15 and 1.6±1.75 respectively. At 2hrs the mean NRS score was 0.6±1.358 and 2.7±2.1 for group 1 and group 2 respectively. At 4hrs the mean NRS score was 1.8±1.54 and 3.3±1.84 for group 1 and group 2 respectively. At 6 hrs mean NRS score was 2.93±1.89 and 5.17±1.26 respectively for group 1 and group 2. At 12hrs mean NRS score was 2.63±1.94 and 4.63±1.71 for group 1 and group 2 respectively. And at 24hrs the mean NRS score was 3.13±1.55 and 4.87±1.7 respectively for group 1 and group 2. Though NRS score was lower in group 1 than group 2 from 1 hours to 24 hours and it was statistically significant as p values are 0.003,0.0004,0.003, <0.0001,0.0002,0.0002 and 0.0002 at 1, 2, 4,6,8,12 and 24hrs.

**TABLE 10:**

| **Time** | **Heart Rate (bpm)** | | **t value** | **p value** |
|---|---|---|---|---|
| | **Group 1 (Mean±SD)** | **Group 2 (Mean±SD)** | | |
| 0h | 94.77±7.04 | 94.9±8.53 | 0.066 | 0.947 |
| 1h | 92.77±7.38 | 93.27±7.35 | 0.263 | 0.793 |
| 2hrs | 90.5±6.43 | 92.63±5.95 | 1.334 | 0.187 |
| 4hrs | 88.87±9.77 | 91.8±7 | 1.337 | 0.186 |
| 6hrs | 86±10.03 | 91.2±6.98 | 2.33 | **0.023** |
| 8hrs | 85.63±7.49 | 91.3±7.11 | 3.006 | **0.003** |
| 12hrs | 84.87±8.12 | 90.3±7.11 | 2.758 | **0.007** |
| 24hrs | 85.13±8.63 | 89.73±7.4 | 2.216 | **0.030** |

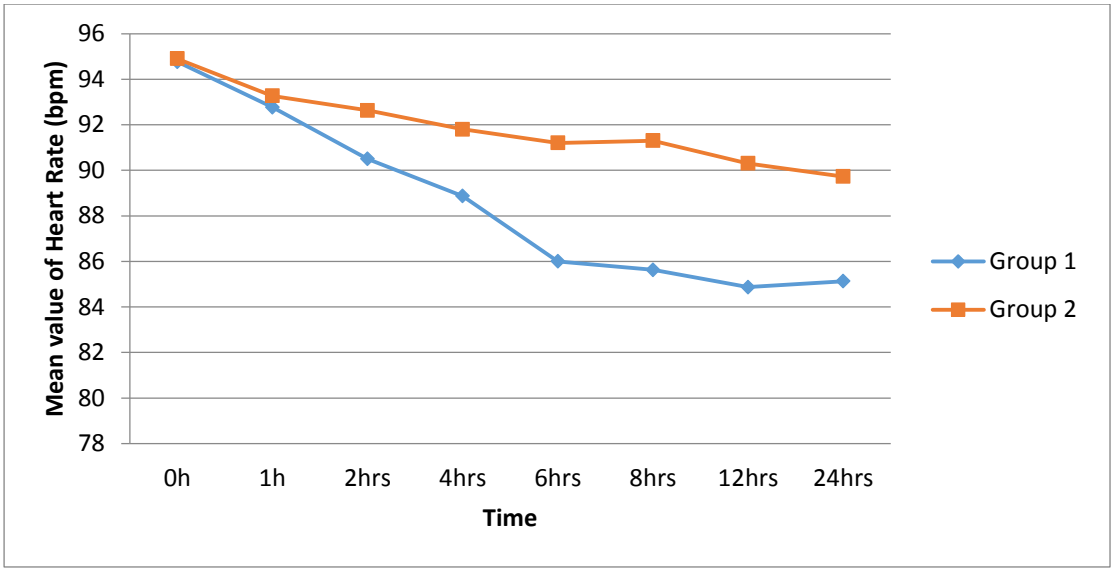



Table 10 shows the HR within Group 1 and group 2 at different time interval. At 0 hour mean HR in group 1 is 94.77±7.04, and group 2 is 94.9±8.53, at 1 hour is 92.77±7.38 and 93.27±7.35, at 2 hours is 90.5.92±6.43 and 92.63±5.95, at 4 hours 88.87±9.77 and 91.8±7, at 6 hours 86±10.03 and 91.2±6.98, at 8 hours 85.63±7.49 and 91.3±7.11, at 12 hours 84.87±8.12 and 90.3±7.11, at 24 hours is 85.13±8.63 and 89.73±7.4. p values from 0-hour,1 hour ,2 hours, 4 hours, 6 hours, 8 hours, 12 hours and 24 hours is 0.947, 0.793, 0.187, 0.186, 0.023 ,0.003, 0.007, 0.030 respectively. It shows that the heart rate increased with the pain intensity in group 2 as compared with group 1 at 6, 8, 12 and 24 hours. The data is statistically significant.

**TABLE 11:**

| Time | SBP (mmHg) | | t value | p value |
|---|---|---|---|---|
| | Group 1 (Mean±SD) | Group 2 (Mean±SD) | | |
| 0h | 122.17±4.68 | 123.73±4.23 | 1.36 | 0.179 |
| 1h | 120.47±4.23 | 122.33±3.68 | 1.823 | 0.073 |
| 2hrs | 121.07±3.63 | 123±4.12 | 1.929 | 0.058 |
| 4hrs | 121.1±4.14 | 123.43±5.19 | 1.925 | 0.059 |
| 6hrs | 122.43±4.1 | 124.43±4.08 | 1.893 | 0.063 |
| 8hrs | 121.47±4.13 | 123.13±3.81 | 1.623 | 0.109 |
| 12hrs | 121.13±2.64 | 122.33±3.16 | 1.599 | 0.115 |
| 24hrs | 120.47±3.96 | 122.73±5.32 | 1.872 | 0.066 |

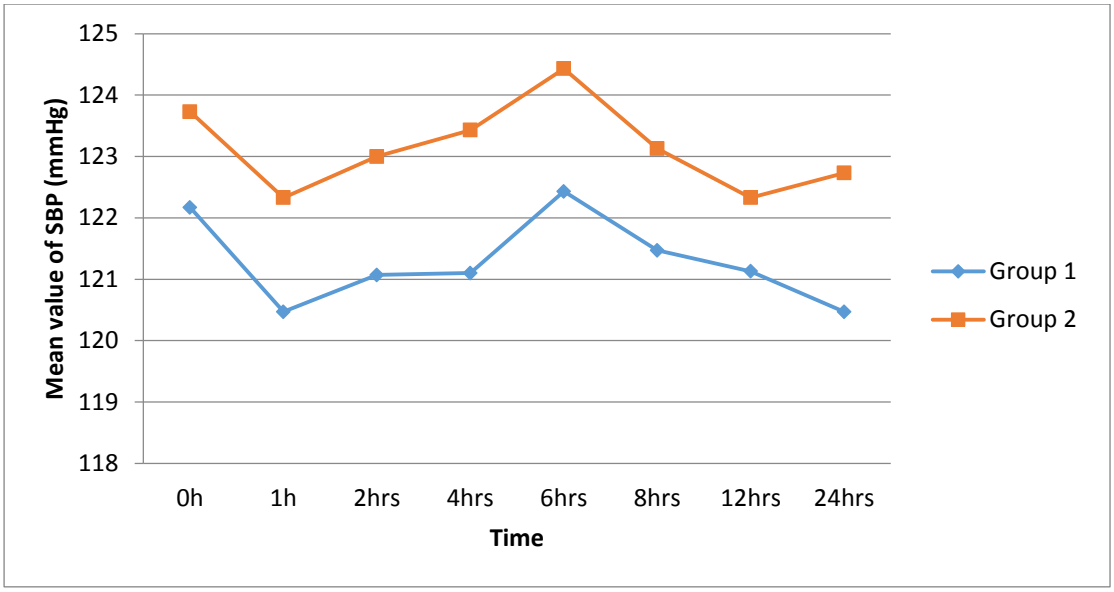



Table 11 shows the SBP within Group 1 and group 2 at different time interval. At 0 hour mean SBP is 122.17±4.68 and 123.73±4.23 in group 1 and group 2 respectively. At 1 hour mean SBP is 120.47±4.23 and 122.33±3.68 in group 1 and group 2 respectively. At 2 hours is 121.107±3.63 and 123±4.1, at 4 hours is 121.1±4.14 and 123.43±5.19 at 6 hours is 122±4.1 and 124.43±4.08, at 8 hours 121.47±4.13 and 123.13±3.81, at 12 hours is 121.13±2.64 and 122.33±3.16 at 24 hours is 120.47±3.96 and 122.73±5.32, respectively. It was statistically not significant. The p values at 0, 1,2,4,6,8,12,24, hours are 0.179, 0.073, 0.058, 0.059, 0.063, 0.109, 0.115,0.066.

**TABLE 12:**

| Time | DBP (mmHg) | | t value | p value |
|---|---|---|---|---|
| | Group 1 (Mean±SD) | Group 2 (Mean±SD) | | |
| 0h | 80.13±3.18 | 81.6±2.8 | 1.896 | 0.063 |
| 1h | 81±2.73 | 82.27±2.15 | 1.997 | 0.050 |
| 2hrs | 80.47±2.71 | 81.93±3.13 | 1.94 | 0.057 |
| 4hrs | 79.73±2.75 | 81.27±4.41 | 1.616 | 0.111 |
| 6hrs | 80.4±3.64 | 82.07±3.17 | 1.892 | 0.063 |
| 8hrs | 79.33±3.75 | 81.13±3.85 | 1.834 | 0.071 |
| 12hrs | 80.23±3.17 | 80.67±4.01 | 0.464 | 0.644 |
| 24hrs | 80.5±3.16 | 82.13±3.36 | 1.94 | 0.057 |

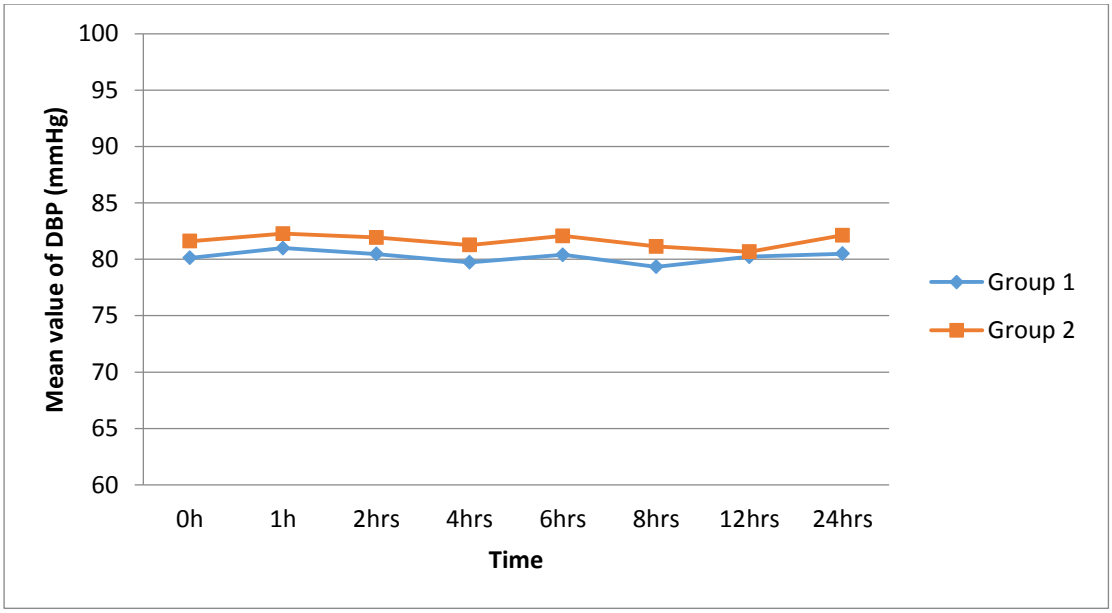



Table 12 shows the DBP within Group 1 and group 2 at different time interval. At 0 hour mean DBP is 80.13±3.18 and 81.6±2.8, at 1 hour DBP is 81±2.73 and 82.27±2.15, at 2 hours is 80.47±2.71 and 81.93±3.13, at 4 hours is 70.73±2.27 and 81.27±4.41, at 6 hours is 80.4±3.64 and 82.07±3.17 , at 8 hours 79.33±3.75 and 81.13±3.85, at 12 hours is 80.23±3.17 and 80.67±4.01, and at 24 hours is 80.5±3.16 and 82.13±3,36 in group 1 and group 2. The data is statistically not significant. The p values at 0,1,2,4,6,8,12 and 24 hours are 0.063,0.050,0.057,0.111.0.063,0.071, 0.644,0.057 respectively.

**TABLE 13:**

| Time | Respiratory rate (min) | | t value | p value |
|---|---|---|---|---|
| | Group 1 (Mean±SD) | Group 2 (Mean±SD) | | |
| 0h | 17.4±1.19 | 17.9±0.8 | 1.906 | 0.617 |
| 1h | 17.7±1.09 | 18.07±0.94 | 1.394 | 0.168 |
| 2hrs | 16.97±1.16 | 17.47±1.11 | 1.709 | 0.092 |
| 4hrs | 16.53±1.36 | 17.03±0.67 | 1.809 | 0.075 |
| 6hrs | 17.03±1.03 | 17.4±0.81 | 1.527 | 0.132 |
| 8hrs | 20.87±4.55 | 16.77±2.21 | 1.192 | 0.238 |
| 12hrs | 17.03±1.52 | 17.63±0.81 | 1.909 | 0.061 |
| 24hrs | 17±1.41 | 17.33±1.12 | 1.011 | 0.316 |

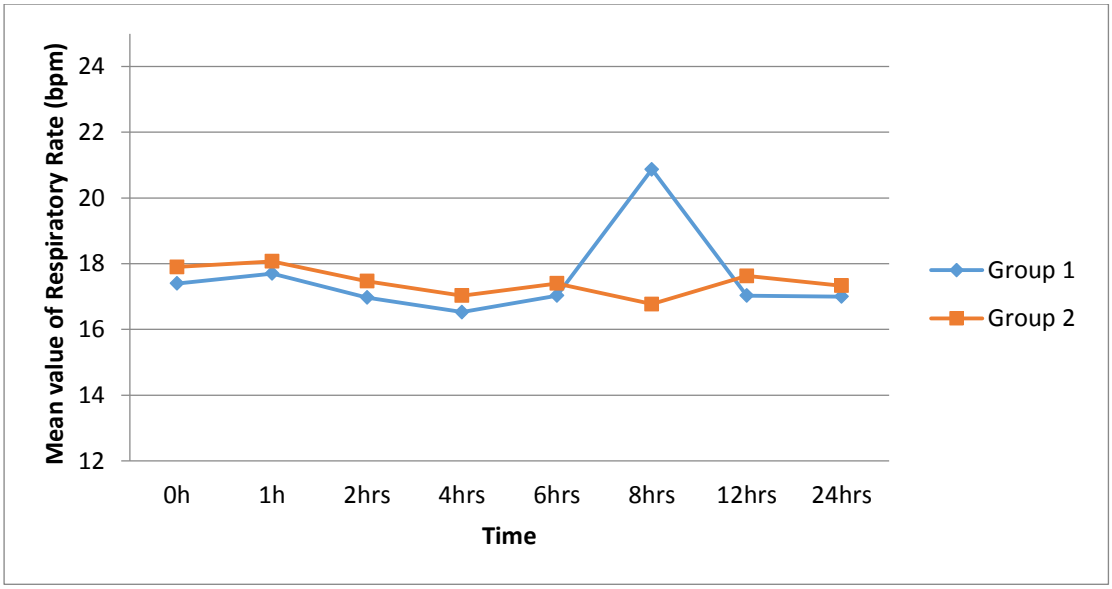



Table 13 is showing mean RR of both the groups at various time intervals in postoperative period and analysed by unpaired t test. It was found that the mean SD in group 1 and group 2 was 17.4±1.19 and 17.9±0.8 at 0 hour, 17,7±1.09 and 18.07±0.94 at 1 hour, 16.97±1.16 and 17.47±1.11 at 2 hours, 16.53±1.36 and 17.03±0.67 at 4 hours, 17.03±1.03 and 1.4±0.81 at 6 hour, 20.87±4.55 and 16.77±2.21 at 8 hours at 12 hour and 17±1.41 and 17.33±1.12 at 24 hours. So the difference in mean $SPO_2$of two groups was not statistically significant at all-time intervals in both the groups as p values at 0,1,2,4,6,8,12 and 24 hours are 0.617,0.168,0.092,0.075,0.132,0.238,0.061 and 0.316 respectively.

**TABLE 14:**

| Time | SPO2% | | t value | p value |
|---|---|---|---|---|
| | Group 1 (Mean±SD) | Group 2 (Mean±SD) | | |
| 0h | 98.73±0.64 | 98.67±0.48 | 0.456 | 0.649 |
| 1h | 98.9±0.84 | 98.57±0.73 | 1.637 | 0.107 |
| 2hrs | 98.33±0.92 | 98.37±0.49 | 0.174 | 0.861 |
| 4hrs | 98.07±0.83 | 98.43±0.57 | 2.000 | 0.050 |
| 6hrs | 99.03±0.89 | 98.63±0.76 | 1.867 | 0.067 |
| 8hrs | 98.83±0.91 | 98.57±0.68 | 1.284 | 0.204 |
| 12hrs | 99.03±0.93 | 98.6±0.77 | 1.968 | 0.053 |
| 24hrs | 99.13±0.9 | 98.77±0.73 | 1.736 | 0.088 |

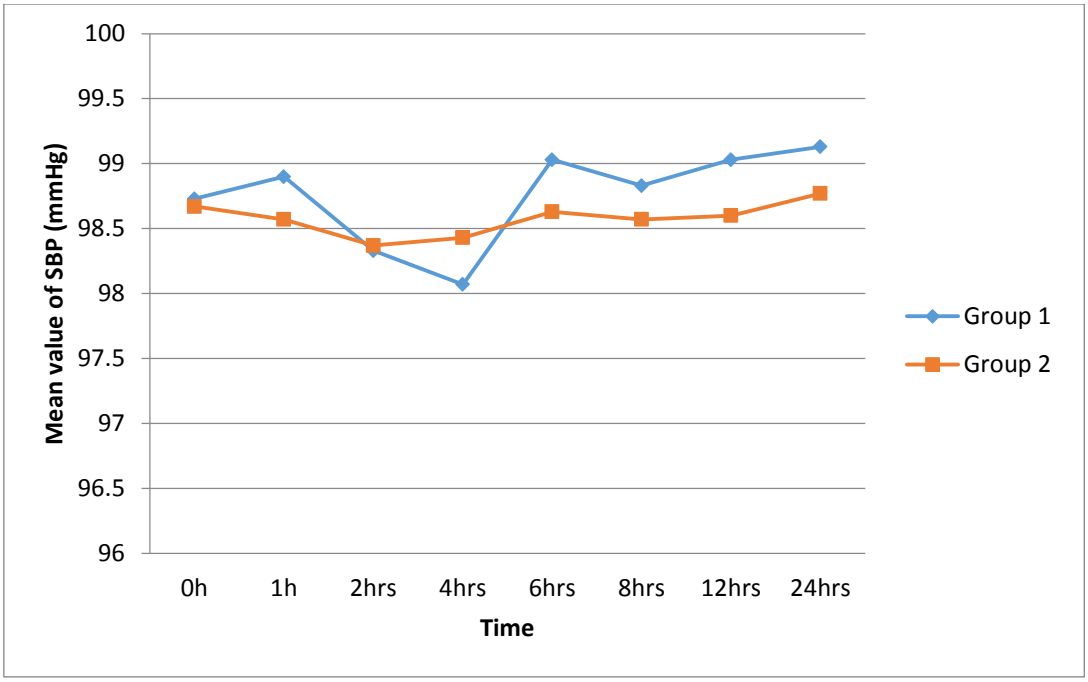



Table 14 is showing mean $SPO_2$ of both the groups at various time intervals in postoperative period and analysed by unpaired t test. It was found that mean $SPO_2$ in group 1 and group was 98.73±0.64 and 98.67±0.48 at 0 hour, 98.9±0.84 and 98.57±0.73 at 1 hour, 98.33±0.92 and 98.37±0.49 at 2 hours, 98.07±0.83 and 98.43±0.57 at 4 hours, 99.03±0.89 and 98.63±0.76 at 6 hours, 98.83±0.91 and 98.57±0.68 at 8 hours, 99.03±0.93 and 98.6±0.77 at 12 hours and 99.13±0.9 and 98.77±0.73 at 24 hours in group 1 and 2 respectively. In group 1 and 2 the difference in mean $SPO_2$ of two groups was not statistically significant at all-time intervals as p values at 0,1,2,4,6,8,12 and 24 hours are 0.649,0.107,0.861,0.050,0.067,0.204,0.053 and 0.088 respectively.

# STATISTICAL ANALYSIS

The data collected during the study was compiled using a Microsoft Excel spread sheet and analyzed statistically using the statistical package for the MedCalc statistical Software version 20.115 for window editions. Qualitative data were presented as number, percentage and Quantitative data were presented as mean±SD and median. Comparison between groups was done by $\chi 2$-test, Fisher exact test, Mann whitney u test and unpaired t test. P value less than 0.05 was considered to be statistically significant.

# DISCUSSIONS

The primary objective of this study was to compare ultrasound guided bilateral subcostal TAP block with intraperitoneal instillation of bupivacaine in patients undergoing laparoscopic cholecystectomy under general anaesthesia. It is quite known that truncal blocks are one of the most commonly used modalities for postoperative pain management in different anterior and posterior abdominal surgeries. Such truncal blocks have gained more popularity with the advantage of real view imaging and lesser failure and toxicity with the introduction of ultrasonogram (USG). It is also well known that efficient postoperative analgesia is an important component to offer adequate perioperative care. One among such modalities is the truncal nerve blocks that are associated with not only improved perioperative outcomes, but also associated with reduction on perioperative stress, improved patient satisfaction, coupled with reduction in opioid consumption, lesser adverse effects and minimal requirement of analegesia.

However, based on literature search, we found that studies are lack in reporting the outcome of on pain relief after laparoscopic cholecystectomy. Considering the gap identified with the use of USG guided TAP block with intraperitoneal instillation of bupivacaine for pain relief after laparoscopic cholecystectomy, the present study was conducted to compare the postoperative pain-relieving efficacy.

In the present study we have involved a total of 60 patients underwent laparoscopic cholecystectomy and randomly divided into two groups of 30 in each group. Where group 2 patient receiving intraperitoneal bupivacaine and group 1 patients receiving bilateral subcostal TAP block. Patients in group 1 as well as group 2 were found to be comparable with respect to their post operative NRS score at 0, 1 2, 4, 6, 8, 12, 24 hours along with their hemodynamical parameters at the same hours. Group 1 as well as group 2 were found to be comparable with respect to the age, sex, BMI & ASA status. The technique of using transversus abdominis block is relatively new in the management of postoperative pain by injecting local anaesthetic that blocks the sensory nerves in the layers after abdominal surgeries [5]. Initially, TAP block used to be performed with landmark based double pop technique, which depended solely on the palpated sensation without a visual guide, it could result in inadvertent intestinal puncture unexpected diffusion of local anaesthetics into additional body parts, which

could result in subsequent motor nerve paralysis and even severe complication such as liver damage. Hence, ultrasound was used in this study, which ensured proper visualisation of anatomical structures as well as needle advancement. However, based on literature search, we found that studies are lack in reporting the outcome of on pain relief after laparoscopic cholecystectomy. Therefore, in our study we have adopted the ultrasound to guide the block to avoid the chances of inadvertent intraperitoneal injection and any further complications that would cause visceral damages [6,7].

Pain scores using NRS were assessed in both the groups at 0 hr, 1 hr, 2 hr, 4 hr, 6 hr, 8 hr, 12 hr and 24 hr post-surgery. There was no statistically significant difference in NRS, at 0 hr after surgery (P-value =0.079) between group 1 and group 2 which may be due to the fact that intravenous fentanyl at induction of anaesthesia, intravenous paracetamol & diclofenac intra-operatively were administered in both the groups. Group 1 showed a significantly lower NRS than that of the Group R as assessed at 1hr (P-value = 0.003), 2 hr (P-value = 0.0004),4 hr (0.003), 6 hr (P-value = <0.001), 8 hr (P-value = 0.0002), 12 hr (P-value =0.0002), and 24 hr (P-value = 0.0002) after the operation indicating that the ultrasound guided TAP block had a good analgesic effect post laparoscopic cholecystectomy for 24 hours.

Several studies have demonstrated the use of opioid after transversus abdominis block reduce pain scores for the patients undergoing laparoscopic cholecystectomy and other abdominal surgeries as well [8-10].

In our study, intravenous paracetamol 1 gm was used as primary rescue analgesic; its consumption was found to be high in group 2 in comparison to group 1 for 24 hours after surgery. Intravenous diclofenac was used as a second line of rescue analgesics, its consumption was also found to be high in group 2 in comparison to group 1 for 24 hrs after surgery. Intravenous tramadol 75 mg was used as a third line of rescue analgesia and its consumption was also found to be high in group 2 in comparison to group 2 for 24hrs after surgery. But the data is statistically insignificant.

In a similar study conducted by P. Petersen et al on the beneficial effect of TAP block after laparoscopic cholecystectomy, patients who received TAP block in addition to a basic analgesic regimen with acetaminophen and ibuprofen after a laparoscopic

cholecystectomy had reduced pain scores during coughing and even reduced morphine consumption in the first 2 hrs after surgery. [105]

In our study we found that patients heart rate was increased with pain in both the groups higher in group 2 as compared to group 1 at 6 hours (p value=0.023), 8 hrs (0.003) ,12 hrs (0.007), 24 hrs (0.030).

Results observed in our study in agreement with an earlier study by Alexander [12] where the authors reported that with administration of 20 ml of 0.25% bupivacaine intraperitoneal after laparoscopic cholecystectomy reduced the requirement of opioids and oral analgesic.

In our current study we have also observed that with the use of TAP block and on comparison with the bupivacaine showed a significant difference in the NRS scores. Results of our present study in good correlation with the recent study conducted by Suseela I [91] and her colleagues in the year 2018, where the authors demonstrated that administration of 20 ml of 0.25% bupivacaine and reduced the NRS pain score was observed in the patients under the TAP block on comparison with the bupivacaine administered patients.

However, few patients have reported shoulder tip pain after laparoscopic cholecystectomy that might be due to diaphragmatic irritation caused by spillage of blood or bile and peritoneum stretching which might be due to pneumoperitoneum and is consistent with our study as well but it was found to be statistically insignificant. Several other studies have also reported similar results where local anaesthetics is of beneficial in reducing the postoperative shoulder tip pain after laparoscopic cholecystectomy [15, 16]

TAP block has been demonstrated to provide excellent analgesia to the skin and musculature of the anterior abdominal wall in patients undergoing Laparoscopic Cholecystectomy. Patients in subcostal TAP block Group showed better pain control and satisfaction when compared to the port site infiltration group. The reason for prolonged duration of analgesic effect after subcostal tap blockade may be due to relatively poor vascularity and slower drug clearance from transversus abdominis plane. Demographic data like age and gender of the patients in two groups were compared and there was no statistically significant difference between two groups.

In our study, we have not observed any significant difference in the demographic data such as age, gender, BMI, ASA grades between the two groups. Furthermore, the hemodynamic parameters such as RR, SBP, DBP, SPO2 did not shown any significant difference between the two groups, however there was statistical significance was observed in heart rate for both the groups.

Complications such as peritoneal and visceral puncture in the TAP block have not been encountered in our study. This might be because of the familiarity with the anatomy, safe use and monitoring & injection techniques, adequate knowledge on the pharmacology and use of local anaesthetics would have played vital role in preventing the possibilities of any complications.

Therefore, the use of ultrasound guided TAP block would be much better to over the postoperative pain and shorten the rescue time with minimum or without any complications after laparoscopic cholecystectomy.

# SUMMARY

Laparoscopic cholecystectomy is the gold standard technique used for the treatment of gallstones disease. Although, it is considered a minimally invasive surgery but still the intensity of pain in early post operative period is significant. But it has various advantages like a smaller and more cosmetic incision, reduced blood loss, and reduced postoperative stay and pain. Pain after laparoscopic cholecystectomy has several components such as parietal, visceral and shoulder tip pain. Traditionally, multimodal analgesia using combination of opioids and non-opioids and IV analgesics were used for pain relief after a laparoscopic cholecystectomy. An untreated pain post operative lap cholecystectomy may result in complications such as atelectasis, hypoxia, pneumonia, deep venous thrombosis, tachycardia, hypertension, and occasionally myocardial ischemia. Transversus abdominis plane block under ultrasound guidance is relatively a newer approach which has been successfully used for lower abdominal surgery. Hence the randomized comparative study titled "comparison of USG guided subcostal transversus abdominis block with intraperitoneal instillation of bupivacaine for pain relief after laparoscopic cholecystectomy"was conducted in the department of Anaesthesiology in Santosh Medical College & Hospital, on 60 patients aged between 18 to 65 years, either sex, ASA physical status I & II, undergoing elective laparoscopic cholecystectomy under general anaesthesia, after getting approval from institutional ethics committee and obtaining written informed consent from each of the patient.

60 patients were randomly divided into two groups:

Group 1 (n=30)- Patients receiving USG guided tap block before surgery performed by trained anaesthetists.

Group 2 (n=30)- Patients receiving 40 ml of 0.25 % bupivacaine after surgery, instillation done by surgeon intraperitoneally at gall blabber bed and under the domes of diaphragm under direct vision.

The efficacy in terms of intensity of abdominal pain using NRS score, presence of complication like nausea, vomiting and shoulder tip pain, haemodynamic (systolic blood pressure, diastolic blood pressure, mean arterial pressure, respiratory rate, heart

rate, SPO2) overall patient satisfaction and total analgesic requirement was assessed at regular intervals throughout the postoperative period for 24 hours.

The data collected during the study was compiled using a Microsoft Excel spread sheet and analysed statistically using the statistical package for the MedCalc statistical Software version 20.115 for window editions.

There was no statistically significant difference found among the groups in terms of the demographic variables, age, sex, BMI and ASA grading. Both the two groups experienced a gradual reduction in pain after laparoscopic cholecystectomy, as evidenced by NRS scores and the need of analgesics. NRS score for abdominal pain was found to be lower in tap block group and it was statistically significant. Complication including nausea, vomiting and shoulder tip pain was less with patients of tap block group and yet it was not statistically significant. Overall patient belongs to tap block were overall satisfied when compared to bupivacaine instillation group and it was statistically significant. Haemodynamically all the patients were stable throughout the postoperative hours but the heart rate of patients belonging to bupivacaine instillation group increased with the pain and it was statistically significant. Due to adequate analgesia, there was reduced in NRS pain score of both the groups but group 1 patients NRS score was less when compared to group 2 and it was statistically significant. Requirement of rescue analgesics observed in many patients of both the groups. It was high in bupivacaine instillation group when compared to TAP block group. No patients experienced any local anaesthetic toxicity.

Hence, it was observed from this study that USG guided TAP block provides effective postoperative analgesia in patients undergoing lap cholecystectomy in the immediate postoperative hours and reduces additional analgesic requirement without causing any adverse reaction.

# CONCLUSION

Based on the observations and results of this study, ultrasound guided bilateral subcostal TAP block provided superior analgesia, less complication, patient satisfaction and markedly decreased the requirement of rescue analgesia in comparison to patients who received intraperitoneal instillation of bupivacaine, for 24 hrs after a laparoscopic cholecystectomy. TAP block is relatively simple to perform didn't cause any significant complications, so it can be a useful analgesic modality for pain relief after a laparoscopic cholecystectomy.

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# ANNEXURES 1

# PROFORMA

## 1.DEMOGRAPHIC PROFILE

| | |
|---|---|
| Name | |
| Age | |
| Sex | |
| Weight | |
| Diagnosis | |
| Operation proposed | |
| MRD No. | |
| Surgery Unit | |
| Date | |

## 2. GENERAL EXAMINATION:

| | |
|---|---|
| GENERAL CONDITION | |
| HEART RATE | |
| BLOOD PRESSURE | |
| TEMPERATURE | |
| SPO2 | |
| MOUTH OPENING | |
| MPG GRADE | |
| NECK MOBILITY | |
| ORAL HYGIENE | |
| ASA GRADE | |

**3. SYSTEMIC EXAMINATION**

| SYSTEMS | INSPECTION | PALPATION | PERCUSSION | AUSCULTATION |
|---|---|---|---|---|
| **CVS** | | | | |
| **RESPIRATORY** | | | | |
| **PER ABDOMEN** | | | | |

**INVESTIGATIONS:**

Complete blood counts
Viral Marker
Bleeding time
LFT
Blood urea
Urine -routine, microscopy
Chest X Ray
Serum electrolytes
ECG
Blood sugar (Random)
Clotting time
Serum creatinine

**<u>NUMERIC RATING SCALE (NRS) PAIN SCORE</u>:**

The concept of Numeric rating scale (NRS), graduated from 0 (no pain) to 10 (the worst imaginable pain) was explained to the patients prior to surgery. Patients in both the groups were assessed and compared with respect to NRS at rest at 0 hr, 1 hr, 2 hr, 4 hr, 6 hr, 8 hr, 12 hr & 24 hr after surgery.

**NRS score post operatively**

| VNRS hours | Group A | Group B |
|---|---|---|
| 0 | | |
| 1 | | |
| 2 | | |
| 4 | | |
| 6 | | |
| 12 | | |
| 24 | | |

## RESCUE ANALGESIA

Patients in both the groups were periodically assessed for post-operative pain at 0 hr, 1 hr, 2 hr, 4 hr, 6 hr, 8 hr, 12 hr & 24 hr after surgery. when the patient pain score (VNRS) was more than 4, intravenous paracetamol 1 gm was given as first line of rescue analgesia; with re-occurrence of pain and VNRS>4, intravenous tramadol 100 mg was given as second line of rescue analgesia. The consumption of all the analgesics given to the patient in post-operative period until 24 hrs was noted.

**POSTOPERATIVE RESCUE ANALGESIC REQUIREMENTS:**

| **GROUP** | **TIME FOR FIRST RESCUE ANALGESIA (mins)** | **CUMULATIVE ANALGESIA REQUIRED IN 24 HOURS.** |
|---|---|---|
| **GROUP A** | | |
| **GROUP B** | | |

Patients in group A as well as group B will be periodically assessed for any incidence of nausea or vomiting and shoulder tip pain at 0 hr, 1 hr, 2 hr, 4 hr, 6 hr, 12 hr & 24 hr after surgery.

## COMPARISON OF NAUSEA/VOMITTING POSTOPERATIVELY

| Hours | Present/absent | Group A | Group B |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

# ANNEXURE 2

# CONSENT FORM

I, _____ Son/ Daughter/ Wife of _____ Resident of _____ Hereby declare that I give my full, free and voluntary informed consent in the thesis **"Comparison of USG guided Subcostal Transversus Abdominis Block with Intraperitoneal Instillation of bupivacaine for Pain Relief after Laparoscopic Cholecystectomy"**

Dr._____ has informed me to my full satisfaction, in the language I understand, about the purpose, nature of study and various laboratory investigations for

the study to be carried out. I have been informed about the duration of the study and instructions to be followed during the study period.

I give full consent for being enrolled in the above study and I reserve my rights to withdraw from this study, whenever I wish without prejudice of my right to undergo further treatment at Santosh Hospital, Ghaziabad U.P.

Patient's/ Patient's relative's signature Doctor's signature

Or thumb impression

Name: Date:

We have witnessed that the patient signed the above form in the presence of his free will after fully understanding its content.

1. 2.

Signature of Witness Signature of Investigator

Name Name:

Dr. Kashish Khan
Post graduate Student
Batch 2020- 2023
Santosh Medical College &
Hospital Ghaziabad – 201001

## ANNEXURE 3

# संतोष मेडिकल कॉलेज एवं अस्पताल (गाजियाबाद)

## सूचित सहमति

**मैं_____बेटा_____निवासी_____**

**_____ घोषणा करता हूं कि मैं डॉ._____, ने मेरी भाषा में अपने अध्ययन, अध्ययन के उद्देश्य के बारे मे, और अध्ययन के दौरान अपनाई जाने वाली विभिन्न प्रयोगशाला जांच के बारे में सूचित कर दिया है। मुझे अध्ययन की अवधि और उसके दौरान अपनाए जाने वाले निर्देश भी मेरी भाषा मे समझा दिए गए हैं| मैं उपरोक्त अध्ययन में बिना किसी दबाव के दाखिला ले रहा हूं और पूर्ण सहमति दे रहा हूं| सन्तोष अस्पताल, गाजियाबाद में अपने आगे के उपचार पर बिना प्रतिकूल प्रभाव डाले इस अध्ययन से और प्रयोगशाला जांच की प्रकृति से मैं जब चाहूँ बाहर जाने के अपने अधिकार को सुरक्षित रख रहा हूं** I

**रोगी / रोगी के रिश्तेदार के हस्ताक्षर डॉक्टर के हस्ताक्षर या अंगूठे का निशान**

**नाम**

**नांक**:

**मेरी उपस्थिति में मरीज ने पूरी तरह से डाकटर के बताए गए अध्ययन और निर्देशों को समझने के बाद अपनी स्वतंत्र इच्छा से ऊपर के फार्म पर हस्ताक्षर कि ए हैं।**

Signature of Investigator
Dr. Kashish khan
Post graduate Student
Batch 2020- 2023
Santosh Medical College & hospital
Ghaziabad – 201001
(U.P)

# ANNEXURE 4

## LIST OF ABBREVIATIONS

| | | |
|---|---|---|
| 1. LC | - | LAPAROSCOPIC CHOLECYSTECTOMY |
| 2. TAP | - | TRANVERSE ABDOMINAL PLANE |
| 3. DVT | - | DEEP VENOUS THROMBOSIS |
| 4. PE | - | PULMONARY EMBOLISM |
| 5. LA | - | LOCAL ANESTHETIC |
| 6. NSAID | - | NON-STEROIDAL ANTI-INFLAMMATORY DRUGS |
| 7. CO2 | - | CARBON DIOXIDE |
| 8. PONV | - | POST OPERATIVE NAUSEA VOMITING |
| 9. I M | - | INTRA MUSCULAR |
| 10. I V | - | INTRA VENOUS |
| 11. CNS | - | CENTRAL NERVOUS SYSTEM |
| 12. VAS SCORE | - | VISUAL ANALOG SCORE |
| 13. PVB | - | PARA VERTEBRAL BLOCK |
| 14. HR | - | HEART RATE |
| 15. SBP | - | SYSTOLIC BLOOD PRESSURE |
| 16. DBP | - | DIASTOLIC BLOOD PRESSURE |
| 17. MAP | - | MEAN ARTERIAL PRESSURE |
| 18. DOA | - | DURATION OF ANALGESIA |
| 19. SPO2 | - | OXYGEN SATURATION |
| 20. ETCO2 | - | END TIDAL CARBON DIOXIDE |
| 21. I P | - | INTRAPERITONEAL |
| 22. STP | - | SHOULDER TIP PAIN |
| 23. DOS | - | DURATION OF SURGERY |
| 24. NRS | - | NUMERIC RATING SCALE |
| 25. TENS | - | TRANSCUTANEOUS ELECTRIC NERVE STIMULATION |
| 26. ASA | - | AMERICAN SOCIETY OF ANAESTHESIOLOGY |

# ANNEXURE 5

# ETHICAL COMMITTEE CLEARANCE

SANTOSH
Deemed to be University
(Established u/s 3 of the UGC Act, 1956)

F. No. SU/2021/1830[37] Dated: 17.07.2021

Subject: Grant of Ethical Clearance for Thesis Protocol Topic **"COMPARISON OF USG GUIDED SUBCOSTAL TRANSVERSUS ABDOMINIS PLANE BLOCK WITH INTRAPERITONEAL INSTILLATION OF BUPIVACAINE FOR PAIN RELIEF AFTER LAPAROSCOPIC CHOLECYSTECTOMY."**, submitted by **Dr. Kashish Khan,** MD/MS student of Batch 2020-2021, Department of **Anaesthesia**.

*****

With reference to his/her request for grant of Ethical Clearance for the Thesis Protocol entitled **"COMPARISON OF USG GUIDED SUBCOSTAL TRANSVERSUS ABDOMINIS PLANE BLOCK WITH INTRAPERITONEAL INSTILLATION OF BUPIVACAINE FOR PAIN RELIEF AFTER LAPAROSCOPIC CHOLECYSTECTOMY."**, **Dr. Kashish Khan** is informed that the Thesis Protocol submitted by him/her was considered by the **Screening Committee** of the Santosh Medical College & Hospital in its meetings held on 19.03.2021, 22.03.2021, 24.03.2021, 25.03.2021, 26.03.2021, 27.03.2021 and 06.04.2021. The recommendations of the **Screening Committee** were considered in detail by the Institutional **Ethics Committee** in its meeting held on **12.07.2021** and the same was **approved** by the **Ethics Committee**.

He /She is informed accordingly for further necessary action.

[Dr. V. P. Gupta]
REGISTRAR

SANTOSH "DEEMED TO BE UNIVERSITY" GHAZIABAD, U.P. REGISTRAR

**Dr. Kashish Khan**
MD/MS student of batch 2020-2021
Department of Anaesthesia
Email: kashishkhan150294@gmail.com

**Copy to:**

1. The Vice Chancellor
2. The Dean, SMC&H
3. The Dean – Research
4. The Dean – Academics
5. The Director - IQAC
6. Dr. Subrata Dutta (Guide)
7. HOD of **Anaesthesia**

# ANNEXURE 6

# PLAGIARISM CERTIFICATE

Ouriginal
by Turnitin

## Document Information

| | |
|---|---|
| **Analyzed document** | kashish thesis 2.docx (D149098993) |
| **Submitted** | 11/9/2022 5:41:00 AM |
| **Submitted by** | Dr Jyoti Batra |
| **Submitter email** | drjyotibatra89@gmail.com |
| **Similarity** | 8% |
| **Analysis address** | drjyotibatra89.sug@analysis.urkund.com |

## Sources included in the report

| | | |
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| W | URL: https://www.researchgate.net/figure/The-duration-of-the-hospital-stay-of-the-4-groups-of-patie...<br>Fetched: 6/25/2021 5:03:28 AM | 4 |
| W | URL: http://52.172.27.147:8080/jspui/bitstream/123456789/37777/1/Dr.%20RAKESH%20BABU.pdf<br>Fetched: 11/13/2021 9:17:42 AM | 7 |
| W | URL: https://www.science.gov/topicpages/s/standard+laparoscopic+cholecystectomy.html<br>Fetched: 11/15/2021 10:28:05 AM | 4 |
| W | URL: https://www.iosrjournals.org/iosr-jdms/papers/Vol20-issue3/Series-2/G2003022833.pdf<br>Fetched: 11/16/2021 10:18:44 AM | 1 |
| W | URL: http://52.172.27.147:8080/jspui/bitstream/123456789/9470/1/kishan.pdf<br>Fetched: 11/12/2021 12:24:02 PM | 5 |

| S. No. | Group | Name | MRD | Preoperative | | | | | | | | Postoperative | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | Complication | Satisfaction | RESCUE ANALGESIA | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Age (yrs) | Gender | ASA garde | BMI | PR | RR | SBP | DBP | SPO2 | Heart Rate (bpm) | | | | | | | | SBP (mmHg) | | | | | | | | DBP (mmHg) | | | | | | | | Respiratory Rate (min) | | | | | | | | SPO2 (%) | | | | | | | | NRS | | | | | | | | Nausea | | | | | | | | | | 6h | 12h | 24h |
| | | | | | | | | | | | | | 0h | 1h | 2hrs | 4hrs | 6hrs | 8hrs | 12hrs | 24hrs | 0h | 1h | 2hrs | 4hrs | 6hrs | 8hrs | 12hrs | 24hrs | 0h | 1h | 2hrs | 4hrs | 6hrs | 8hrs | 12hrs | 24hrs | 0h | 1h | 2hrs | 4hrs | 6hrs | 8hrs | 12hrs | 24hrs | 0h | 1h | 2hrs | 4hrs | 6hrs | 8hrs | 12hrs | 24hrs | 0h | 1h | 2hrs | 4hrs | 6hrs | 8hrs | 12hrs | 24hrs | 0h | 1h | 2hrs | 4hrs | 6hrs | 8hrs | 12hrs | 24hrs | | | | | |
| 1 | 1 | Gomati | 17105623 | 42 | F | 1 | 22.1 | 102 | 20 | 118 | 78 | 99 | 108 | 100 | 89 | 72 | 79 | 92 | 71 | 85 | 123 | 127 | 122 | 122 | 122 | 118 | 122 | 117 | 83 | 85 | 82 | 77 | 82 | 71 | 81 | 76 | 15 | 18 | 19 | 18 | 17 | 17 | 19 | 18 | 98 | 99 | 99 | 99 | 100 | 100 | 100 | 100 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 1 | NP | NP | NP | P | NP | NP | NP | P | NIL | PRESENT | NIL | NIL | NIL |
| 2 | 1 | Usha rani | 17107668 | 42 | F | 1 | 19.2 | 98 | 20 | 110 | 76 | 98 | 97 | 95 | 81 | 88 | 70 | 76 | 68 | 69 | 123 | 129 | 132 | 122 | 120 | 122 | 120 | 125 | 81 | 79 | 84 | 79 | 82 | 79 | 79 | 84 | 17 | 19 | 18 | 15 | 17 | 15 | 16 | 16 | 99 | 99 | 99 | 98 | 99 | 100 | 99 | 100 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | NP | NP | NP | P | NP | NP | NP | NP | NAUSEA, STP | | NIL | NIL | NIL |
| 3 | 1 | Yogesh | 17109290 | 38 | M | 1 | 23.9 | 94 | 19 | 120 | 80 | 100 | 98 | 72 | 78 | 70 | 99 | 81 | 78 | 76 | 119 | 121 | 126 | 122 | 126 | 122 | 122 | 129 | 81 | 81 | 78 | 79 | 84 | 79 | 83 | 82 | 19 | 17 | 17 | 16 | 16 | 16 | 15 | 16 | 99 | 100 | 98 | 99 | 100 | 99 | 100 | 100 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | NP | NP | NP | NP | NP | NP | NP | NP | NIL | PRESENT | NIL | NIL | NIL |
| 4 | 1 | Sudha | 17088014 | 37 | F | 1 | 20 | 79 | 16 | 118 | 82 | 98 | 96 | 91 | 87 | 77 | 68 | 70 | 74 | 69 | 123 | 125 | 116 | 122 | 126 | 122 | 116 | 113 | 81 | 85 | 76 | 75 | 82 | 75 | 79 | 76 | 17 | 19 | 16 | 15 | 16 | 14 | 14 | 16 | 98 | 98 | 98 | 98 | 99 | 100 | 99 | 98 | 0 | 0 | 0 | 2 | 3 | 3 | 4 | 3 | NP | NP | NP | NP | NP | NP | NP | NP | NIL | PRESENT | NIL | NIL | NIL |
| 5 | 1 | Nikki | 1711347 | 19 | F | 1 | 18.9 | 81 | 15 | 120 | 80 | 100 | 89 | 95 | 89 | 75 | 82 | 75 | 85 | 76 | 125 | 117 | 120 | 120 | 122 | 120 | 120 | 119 | 83 | 79 | 80 | 81 | 86 | 81 | 81 | 80 | 18 | 18 | 18 | 17 | 15 | 16 | 18 | 14 | 99 | 99 | 99 | 99 | 100 | 99 | 100 | 100 | 0 | 0 | 0 | 1 | 2 | 3 | 3 | 3 | NP | NP | NP | NP | NP | NP | NP | NP | NIL | PRESENT | NIL | NIL | NIL |
| 6 | 1 | Maya devi | 17109996 | 35 | F | 1 | 21.1 | 84 | 17 | 122 | 80 | 99 | 100 | 100 | 91 | 86 | 69 | 86 | 91 | 81 | 119 | 121 | 122 | 118 | 114 | 118 | 122 | 121 | 79 | 81 | 78 | 79 | 76 | 79 | 81 | 76 | 18 | 17 | 17 | 19 | 18 | 17 | 17 | 15 | 100 | 100 | 99 | 98 | 100 | 100 | 100 | 100 | 2 | 0 | 0 | 5 | 3 | 0 | 0 | 2 | NP | NP | NP | P | NP | NP | NP | NP | NAUSEA | | NIL | NIL | NIL |
| 7 | 1 | Ramesh chand | 17125476 | 55 | M | 2 | 22.5 | 107 | 15 | 116 | 82 | 98 | 102 | 98 | 97 | 99 | 88 | 92 | 91 | 99 | 119 | 111 | 114 | 120 | 125 | 120 | 122 | 121 | 81 | 77 | 76 | 79 | 82 | 79 | 81 | 80 | 16 | 19 | 17 | 15 | 16 | 21 | 17 | 18 | 99 | 99 | 97 | 97 | 98 | 98 | 100 | 100 | 0 | 0 | 0 | 1 | 3 | 3 | 3 | 3 | NP | NP | PP | NP | NP | NP | NP | NP | NAUSEA | | NIL | NIL | NIL |
| 8 | 1 | Sayra | 17115764 | 50 | F | 1 | 24.7 | 90 | 16 | 124 | 84 | 100 | 98 | 93 | 90 | 91 | 74 | 92 | 77 | 85 | 121 | 119 | 120 | 122 | 123 | 122 | 116 | 119 | 81 | 81 | 82 | 83 | 86 | 83 | 77 | 82 | 19 | 16 | 18 | 17 | 17 | 18 | 19 | 17 | 99 | 100 | 99 | 98 | 98 | 100 | 99 | 100 | 4 | 4 | 3 | 4 | 5 | 3 | 7 | 8 | NP | NP | NP | NP | NP | NP | NP | NP | NIL | | NIL | RECEIVED<br>RECEIVED | |
| 9 | 1 | Vimla | 17125761 | 60 | F | 1 | 18.6 | 101 | 15 | 122 | 80 | 98 | 88 | 80 | 83 | 80 | 85 | 88 | 94 | 98 | 121 | 117 | 122 | 122 | 125 | 122 | 122 | 131 | 79 | 75 | 82 | 79 | 86 | 79 | 77 | 78 | 17 | 19 | 17 | 15 | 16 | 15 | 17 | 18 | 100 | 98 | 99 | 97 | 100 | 99 | 99 | 98 | 0 | 0 | 0 | 1 | 1 | 3 | 2 | 2 | NP | NP | NP | NP | NP | NP | NP | NP | STP | PRESENT | NIL | NIL | NIL |
| 10 | 1 | Iqbal | 17117270 | 38 | M | 1 | 24.3 | 79 | 17 | 120 | 76 | 99 | 87 | 91 | 89 | 99 | 71 | 90 | 82 | 81 | 125 | 119 | 122 | 116 | 125 | 116 | 120 | 121 | 77 | 83 | 80 | 79 | 82 | 79 | 75 | 76 | 19 | 18 | 19 | 17 | 17 | 14 | 16 | 18 | 99 | 99 | 97 | 98 | 99 | 99 | 98 | 98 | 0 | 0 | 3 | 4 | 2 | 3 | 2 | 3 | NP | NP | NP | NP | NP | NP | NP | NP | NIL | PRESENT | NIL | NIL | NIL |
| 11 | 1 | Rani | 17123178 | 40 | F | 1 | 20.7 | 80 | 16 | 122 | 80 | 99 | 96 | 88 | 79 | 82 | 74 | 82 | 84 | 87 | 121 | 123 | 122 | 122 | 121 | 122 | 120 | 121 | 79 | 81 | 80 | 81 | 81 | 81 | 84 | 80 | 17 | 18 | 15 | 15 | 16 | 19 | 15 | 20 | 99 | 98 | 99 | 99 | 100 | 99 | 100 | 98 | 0 | 0 | 0 | 4 | 5 | 5 | 5 | 4 | NP | NP | NP | NP | NP | NP | NP | NP | NIL | PRESENT | NIL | NIL | NIL |
| 12 | 1 | Shatiyali | 17128907 | 35 | F | 1 | 19.7 | 80 | 15 | 120 | 80 | 100 | 90 | 93 | 101 | 91 | 91 | 92 | 90 | 69 | 121 | 115 | 122 | 120 | 123 | 122 | 120 | 119 | 77 | 81 | 76 | 81 | 81 | 81 | 81 | 78 | 17 | 17 | 17 | 15 | 16 | 21 | 18 | 16 | 99 | 100 | 98 | 98 | 100 | 98 | 99 | 98 | 0 | 0 | 4 | 3 | 4 | 6 | 6 | 5 | NP | NP | NP | P | NP | P | NP | P | NAUSEA | | NIL | NIL | NIL |
| 13 | 1 | Kusum | 17129486 | 42 | F | 1 | 23.7 | 91 | 16 | 118 | 80 | 98 | 91 | 86 | 96 | 79 | 87 | 72 | 85 | 74 | 119 | 123 | 120 | 112 | 113 | 120 | 118 | 121 | 71 | 75 | 82 | 71 | 79 | 67 | 75 | 78 | 16 | 16 | 17 | 16 | 16 | 17 | 14 | 16 | 99 | 99 | 100 | 99 | 100 | 100 | 99 | 100 | 0 | 0 | 0 | 1 | 1 | 3 | 4 | 3 | NP | NP | NP | NP | NP | NP | NP | NP | NIL | PRESENT | NIL | NIL | NIL |
| 14 | 1 | Ponali | 17182909 | 46 | M | 1 | 25.6 | 100 | 17 | 124 | 82 | 100 | 107 | 102 | 93 | 102 | 99 | 92 | 92 | 85 | 123 | 117 | 122 | 120 | 123 | 126 | 122 | 123 | 81 | 81 | 82 | 83 | 79 | 83 | 85 | 86 | 17 | 18 | 16 | 15 | 19 | 16 | 16 | 19 | 98 | 99 | 98 | 99 | 100 | 100 | 100 | 100 | 0 | 0 | 0 | 2 | 5 | 8 | 5 | 6 | NP | NP | NP | NP | PP | NP | NP | NP | NAUSEA | | RECEIVED | NIL | NIL |
| 15 | 1 | Subhi | 17129770 | 26 | F | 1 | 19 | 77 | 15 | 118 | 80 | 99 | 89 | 89 | 83 | 87 | 82 | 92 | 88 | 91 | 123 | 121 | 112 | 122 | 121 | 120 | 126 | 121 | 79 | 83 | 78 | 83 | 75 | 81 | 81 | 82 | 15 | 18 | 17 | 19 | 18 | 24 | 18 | 15 | 99 | 99 | 98 | 97 | 98 | 98 | 98 | 98 | 0 | 0 | 0 | 1 | 1 | 3 | 1 | 3 | NP | NP | NP | NP | NP | NP | NP | NP | NIL | PRESENT | NIL | NIL | NIL |
| 16 | 1 | Soniya | 17129940 | 50 | F | 1 | 20.8 | 89 | 16 | 124 | 80 | 98 | 92 | 93 | 92 | 93 | 99 | 98 | 82 | 98 | 121 | 127 | 122 | 124 | 123 | 126 | 122 | 119 | 81 | 83 | 84 | 81 | 75 | 81 | 85 | 80 | 18 | 17 | 19 | 18 | 19 | 19 | 19 | 17 | 98 | 99 | 97 | 99 | 99 | 100 | 99 | 98 | 0 | 0 | 0 | 1 | 1 | 3 | 1 | 3 | NP | NP | NP | P | P | NP | NP | NP | NAUSEA | | NIL | NIL | NIL |
| 17 | 1 | Ibinula | 17129015 | 50 | F | 1 | 20 | 89 | 15 | 122 | 80 | 99 | 95 | 96 | 99 | 90 | 98 | 78 | 69 | 90 | 121 | 123 | 120 | 122 | 121 | 122 | 120 | 119 | 77 | 85 | 84 | 77 | 79 | 81 | 77 | 82 | 18 | 18 | 16 | 17 | 17 | 24 | 16 | 17 | 99 | 99 | 98 | 97 | 98 | 98 | 98 | 99 | 0 | 0 | 0 | 1 | 1 | 3 | 1 | 3 | NP | NP | NP | NP | NP | NP | NP | NP | NIL | PRESENT | NIL | NIL | NIL |
| 18 | 1 | Garima | 17132429 | 30 | F | 1 | 21.6 | 70 | 17 | 118 | 76 | 98 | 83 | 83 | 88 | 88 | 81 | 86 | 74 | 85 | 119 | 125 | 122 | 124 | 121 | 120 | 123 | 117 | 75 | 81 | 82 | 81 | 77 | 79 | 85 | 77 | 17 | 16 | 16 | 19 | 18 | 21 | 19 | 18 | 98 | 99 | 98 | 98 | 98 | 98 | 97 | 100 | 0 | 0 | 0 | 1 | 2 | 3 | 3 | 3 | NP | NP | NP | NP | NP | NP | NP | NP | NIL | PRESENT | NIL | NIL | NIL |
| 19 | 1 | Anusha | 17133253 | 30 | F | 1 | 22.3 | 75 | 16 | 120 | 84 | 98 | 86 | 86 | 94 | 93 | 90 | 94 | 83 | 99 | 121 | 121 | 124 | 122 | 123 | 112 | 119 | 125 | 79 | 81 | 82 | 77 | 83 | 77 | 81 | 85 | 17 | 18 | 18 | 16 | 16 | 25 | 18 | 16 | 99 | 97 | 98 | 99 | 98 | 98 | 98 | 100 | 0 | 0 | 4 | 5 | 7 | 3 | 5 | 4 | NP | NP | NP | NP | NP | NP | NP | NP | NIL | | RECEIVED | NIL | NIL |
| 20 | 1 | Rekha | 17120499 | 45 | F | 1 | 18.8 | 84 | 14 | 116 | 80 | 99 | 88 | 89 | 84 | 98 | 94 | 92 | 85 | 92 | 121 | 119 | 122 | 124 | 120 | 122 | 125 | 121 | 81 | 79 | 78 | 79 | 81 | 83 | 85 | 86 | 19 | 17 | 18 | 15 | 18 | 28 | 19 | 19 | 98 | 100 | 97 | 98 | 99 | 98 | 100 | 100 | 0 | 0 | 0 | 1 | 2 | 4 | 4 | 3 | NP | NP | NP | NP | NP | NP | NP | NP | NIL | | NIL | NIL | NIL |
| 21 | 1 | Beena | 17135590 | 35 | F | 1 | 23.2 | 98 | 15 | 122 | 84 | 98 | 99 | 99 | 91 | 98 | 85 | 93 | 98 | 82 | 121 | 121 | 116 | 112 | 120 | 116 | 121 | 121 | 77 | 85 | 82 | 77 | 81 | 79 | 79 | 87 | 17 | 19 | 15 | 18 | 17 | 23 | 18 | 19 | 99 | 98 | 98 | 97 | 100 | 99 | 98 | 99 | 0 | 0 | 0 | 3 | 3 | 3 | 1 | 3 | NP | NP | NP | NP | NP | NP | NP | NP | NIL | PRESENT | NIL | NIL | NIL |
| 22 | 1 | Shakuntala | 17136114 | 44 | F | 1 | 24.4 | 73 | 17 | 124 | 80 | 99 | 86 | 86 | 99 | 99 | 81 | 76 | 94 | 88 | 123 | 123 | 118 | 121 | 122 | 132 | 121 | 123 | 79 | 81 | 82 | 79 | 75 | 77 | 81 | 82 | 18 | 19 | 17 | 17 | 19 | 27 | 18 | 18 | 98 | 99 | 100 | 97 | 98 | 97 | 99 | 99 | 0 | 0 | 0 | 1 | 4 | 3 | 1 | 3 | NP | NP | NP | NP | NP | NP | P | P | NAUSEA, STP | | NIL | NIL | NIL |
| 23 | 1 | Ravi | 17139926 | 31 | M | 1 | 29.2 | 87 | 17 | 116 | 78 | 99 | 98 | 100 | 87 | 79 | 87 | 80 | 94 | 87 | 119 | 121 | 120 | 119 | 122 | 120 | 117 | 121 | 81 | 85 | 82 | 83 | 79 | 81 | 79 | 80 | 19 | 17 | 18 | 16 | 17 | 27 | 16 | 17 | 99 | 100 | 99 | 97 | 98 | 99 | 98 | 98 | 0 | 0 | 0 | 1 | 3 | 2 | 1 | 3 | NP | NP | NP | NP | NP | NP | NP | NP | NIL | PRESENT | NIL | NIL | NIL |
| 24 | 1 | Asha devi | 17137530 | 52 | F | 1 | 23.1 | 104 | 18 | 124 | 82 | 100 | 110 | 108 | 93 | 81 | 77 | 92 | 85 | 77 | 123 | 117 | 122 | 121 | 116 | 118 | 121 | 115 | 83 | 81 | 82 | 81 | 77 | 75 | 81 | 78 | 19 | 17 | 16 | 15 | 17 | 26 | 17 | 15 | 99 | 99 | 98 | 99 | 98 | 100 | 100 | 98 | 0 | 0 | 0 | 1 | 3 | 3 | 4 | 3 | NP | NP | NP | NP | NP | NP | NP | P | NIL | PRESENT | NIL | NIL | NIL |
| 25 | 1 | Soni | 17145669 | 42 | F | 1 | 20 | 87 | 15 | 116 | 78 | 98 | 99 | 99 | 96 | 98 | 99 | 85 | 91 | 99 | 117 | 119 | 124 | 121 | 122 | 126 | 123 | 121 | 79 | 79 | 82 | 81 | 75 | 81 | 81 | 77 | 19 | 18 | 16 | 16 | 18 | 29 | 17 | 18 | 98 | 98 | 97 | 99 | 98 | 98 | 100 | 98 | 0 | 0 | 0 | 1 | 4 | 3 | 2 | 3 | NP | NP | NP | NP | NP | NP | NP | NP | NIL | PRESENT | NIL | NIL | NIL |
| 26 | 1 | Sandeep | 17147036 | 48 | M | 1 | 22.4 | 75 | 16 | 120 | 82 | 98 | 87 | 89 | 101 | 80 | 94 | 76 | 87 | 94 | 119 | 123 | 120 | 117 | 120 | 122 | 123 | 119 | 81 | 81 | 82 | 79 | 81 | 85 | 79 | 82 | 16 | 19 | 15 | 18 | 17 | 23 | 18 | 17 | 99 | 99 | 97 | 100 | 99 | 98 | 99 | 99 | 0 | 0 | 0 | 1 | 3 | 3 | 2 | 2 | NP | NP | NP | NP | NP | NP | NP | NP | NIL | PRESENT | NIL | NIL | NIL |
| 27 | 1 | Mamta | 17152253 | 40 | F | 1 | 19.9 | 90 | 16 | 116 | 78 | 98 | 97 | 95 | 88 | 99 | 98 | 82 | 85 | 91 | 130 | 117 | 122 | 127 | 130 | 124 | 119 | 121 | 87 | 81 | 84 | 81 | 79 | 81 | 75 | 82 | 17 | 17 | 16 | 16 | 17 | 26 | 17 | 18 | 99 | 98 | 100 | 99 | 100 | 98 | 98 | 99 | 4 | 5 | 4 | 5 | 8 | 5 | 6 | 5 | NP | NP | NP | NP | NP | NP | NP | NP | NIL | | RECEIVED | NIL | NIL |
| 28 | 1 | Sameera | 17182082 | 50 | F | 2 | 23.7 | 103 | 17 | 126 | 82 | 97 | 102 | 98 | 84 | 86 | 90 | 91 | 92 | 81 | 143 | 111 | 120 | 135 | 130 | 132 | 128 | 111 | 87 | 77 | 74 | 85 | 89 | 85 | 85 | 79 | 18 | 19 | 16 | 17 | 18 | 21 | 16 | 16 | 97 | 99 | 97 | 98 | 99 | 98 | 100 | 100 | 0 | 0 | 0 | 1 | 4 | 3 | 1 | 3 | NP | NP | NP | NP | NP | NP | NP | NP | NIL | PRESENT | NIL | NIL | NIL |
| 29 | 1 | RK verma | 1716864 | 37 | M | 1 | 20.4 | 85 | 16 | 124 | 80 | 99 | 97 | 99 | 94 | 107 | 91 | 85 | 96 | 85 | 123 | 119 | 122 | 123 | 122 | 120 | 121 | 119 | 81 | 81 | 78 | 81 | 81 | 81 | 79 | 82 | 16 | 18 | 17 | 16 | 17 | 24 | 16 | 16 | 99 | 97 | 99 | 98 | 99 | 98 | 100 | 100 | 0 | 0 | 0 | 1 | 4 | 3 | 1 | 3 | NP | NP | NP | NP | NP | NP | NP | NP | NIL | PRESENT | NIL | NIL | NIL |
| 30 | 1 | Dheeraj | 17161582 | 30 | M | 1 | 21.2 | 79 | 15 | 120 | 80 | 98 | 88 | 90 | 99 | 99 | 98 | 89 | 81 | 91 | 119 | 123 | 124 | 119 | 132 | 120 | 123 | 121 | 83 | 83 | 80 | 81 | 77 | 77 | 75 | 82 | 17 | 15 | 18 | 18 | 16 | 23 | 15 | 17 | 99 | 100 | 98 | 97 | 98 | 98 | 98 | 99 | 0 | 0 | 0 | 1 | 3 | 3 | 1 | 4 | NP | NP | NP | NP | NP | NP | P | P | NAUSEA | | NIL | NIL | NIL |

| S. No. | Group | Name | MRD | Preoperative | | | | | | | | Postoperative | | | | | | | |